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TESTING AND THE ELEMENTARY MATHEMATICS PROGRAM IN ZONE ONE:  
A SCHOOL SYSTEM APPROACH

by

ALVIN LEONARD ANDERSON



A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH  
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ELEMENTARY EDUCATION

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THE UNIVERSITY OF ALBERTA  
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled TESTING AND THE ELEMENTARY MATHEMATICS PROGRAM IN ZONE ONE: A SCHOOL SYSTEM APPROACH submitted by ALVIN LEONARD ANDERSON in partial fulfilment of the requirements for the degree of DOCTOR OF PHILOSOPHY in ELEMENTARY EDUCATION.



## ABSTRACT

It seems apparent that if a curriculum development is undertaken, at whatever level, that the evaluation process must be extended to the content, procedures, and presuppositions that were chosen during the developmental stage. This would also apply if it were the implementation of a curriculum that was of concern.

If however the focus is to be that of the student, in assessing his or her understanding of a particular subject, then perhaps one can do more than implicate the development and implementation of the curriculum in question.

This in fact was the approach taken in this study. Although some evaluative implications for the program were revealed, one of the main purposes was to assess pupil knowledge and understanding of the elementary mathematics objectives in the Program of Studies for Elementary Schools (1978).

Over 12 000 students in each of 1978 and 1979 were administered tests which were criterion referenced to the Alberta program. The data collected were also to provide teachers and supervisors with the diagnostic information that could make instruction more purposeful.

Besides collecting pupil scores for objectives within the Number, Operations and Properties, Measurement, Geometry, and Graphing strands for each grade level, other variables such as age of entry to school, sex, geographical



location and sectarian (Public-Separate) placement were examined.

Mathematics achievements in the primary grades may be considered as a success experience for the majority of students. Certainly the children who are coming to and completing grade one appear able to handle their program.

There are however the hints of student weaknesses, at the grade one year, which may have an impact on the lower achievement in the higher grades. For example the important concept of place value has a weak start in grade one.

Metric measurement as a system has not been successfully implemented, particularly at the Division II level.

Many students experienced difficulty with such topics as using coins for purchasing things, writing time, writing ordered pairs and proportional ratios, understanding decimals, multiplying and dividing numbers, and constructing graphs.

Performance in problem solving was consistently low throughout the grades.

The achievement of the early and late starters in school was similar for the first three years. From grade four and beyond however, the pupils who had started school older than 6.0 years did consistently better in virtually every area of the program.

Public school students outperform Separate school students and vice versa in about the same number of



situations. The Separate students appear to have made the greater gains for 1979 however.

Another important aspect of this study was the Zone One teacher's interpretations of student achievement in 1978. These teachers considered the mismatch of the authorized textbooks with the program, and the failure of students to master the mathematics concepts because of inadequate learning skills, as the primary reasons for more students not being able to reach the 85-100 percent achievement category.

Concerning the main problem areas within the strands, teachers thought that the difficulties in the Number and the Operations and Properties strands were due to the students not mastering the previous prerequisite concepts. Teachers believed that the failures within the Measurement, Geometry, and Graphing strands were due to the lack of instructional emphasis that would be required for students to succeed.



## ACKNOWLEDGEMENTS

As this research project comes to a conclusion one cannot help but be reminded of the contributions of so many people.

The first thanks goes to Dr. George Cathcart my adviser; for his patience, encouragement and the continuous giving of his time to my total program.

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## CHAPTER I

### INTRODUCTION TO THE PROBLEM

A revised mathematics curriculum was placed into Alberta elementary schools as a program of studies in September of 1977. A good deal of discussion has been centered on the implementation of this program.

Politicians and many of the general public were pleased with what they heard about the program's move towards the "basics" in whatever narrow view they perceived the change to be. Many teachers were expressing mixed feelings relative to the specification of mathematics objectives. This concern was due in part to the fact that the authorized textbooks could not be the exclusive instructional tool. For these and perhaps other reasons the extent to which the elementary mathematics program has been effectively implemented is yet to be determined.

Regardless of implementation status the program is in place as an official program of studies. The development of its scope and sequence of concepts, skills, and understandings in objective form was assigned to an ad hoc working committee under the direction of Alberta Education's Curriculum Branch and an appointed Mathematics Coordinating Committee. Program development, piloting and revision to final form took place from October 1974 through March of 1977. Over 100 schools were involved in extensive piloting of the program.



Besides presenting mathematics content in objective form within the five strands of Number, Operations and Properties, Measurement, Geometry, and Graphing at the six grade levels, other changes were to be included in the revision.

The Measurement strand was to be exclusively metric. With the metric system based on powers of ten came an accompanying emphasis on decimal fractions and a reduction in the amount of work with common fractions.

Modifications were made to the Geometry strand as well. Children's experience with 3-dimensional form was considered in removing the point-set start at the primary level. Motion geometry objectives were included for the upper elementary students.

The program as outlined was to be specified as core. This was to be accomplished by building the concepts, skills and understandings upon specified objectives and including predominantly essentials at each grade level. These were to be considered as the 'building blocks' to any and all mathematics required of students in the future.



TABLE 1

## NUMBER OF OBJECTIVES IN EACH GRADE LEVEL

Grade	Grade	Grade	Grade	Grade	Grade
I	II	III	IV	V	VI
18	28	33	35	32	27

The number of mathematics objectives that are included for each grade level in the Alberta program are given in Table 1. The objectives are stated in full in Chapter 4 (Grade 1) through Chapter 9 (Grade 6) where the items, achievement scores and statistical analysis related to the specific objectives are contained.

#### A. BACKGROUND TO THE PROBLEM

The new Elementary School Mathematics Program with its objective based system of presenting content has necessitated revisions to current practices of evaluating students. Presently available standardized tests are inadequate in terms of covering the Program of Studies Objectives at every grade level of the elementary school. This statement has been verified by the Alberta Education's Mathematics Sub-Committee Report (1976) on the assessment of various standardized tests. The following tests were examined by the group:

Canadian Test of Basic Skills, Form 3 (levels 7 to



14)

Metropolitan Achievement Test, Primary II

(Intermediate and Advanced)

Sequential Tests of Educational Progress, Series II

(Form A & Form 3A)

Stanford Achievement Test (Intermediate and

Advanced)

SRA Assessment Survey Achievement Series (Primary I,

Primary II, Blue Green and Red)

Their summary is worth noting:

The main problem with the tests in general was not so much with what was tested and which was not in the curriculum, but what is in the curriculum and not tested. Granted, a good test need not test every objective; but a sampling from each strand should be included. Some or all of the measurement, geometry and graphing strands were either underrepresented or omitted entirely on all of the elementary tests. This is not a "fault" of the test but rather an indication of the "poor fit" with the Alberta Curriculum (Chandler, 1976, p.2)

The commonly voiced criticisms of the new program, especially with the knowledge concerning the poor fit of standardized tests, was in the area of determining the achievement levels of students, and in gauging the effectiveness of various instructional designs. The Curriculum Guide is of little help in this regard. The term "core" is used to define the minimum essentials of mathematics learning to take place at each grade level. The intent of this re-definition of curriculum was that student 'mastery' of content would not only be possible, but likely for the 'majority' of students at the elementary school



level.

Neither of the terms mastery or majority are clearly defined in the Program of Studies or Curriculum Guide for Elementary School Mathematics (1977). Yet the general objectives outlined in the in the Guide state that instructional programs should foster:

1. A sense of accomplishment and success with mathematics which should lead to a positive self concept, and
2. A positive attitude towards mathematics. (p.7)

At no time in the curriculum development plan was research conducted on the possibilities for student mastery. There is to date, no certainty as to whether or not students do, or in fact will, master the concepts, skills or understandings as specified in the mathematics objectives. Placement of, and adjustments or modification to, grade level content were made more on the basis of teacher and ad hoc committee perceptions. These were perceptions of how well students might perform. Mastery levels were not specified for pilot teachers so that comments received by Ad Hoc members reflected varying interpretations of how well students would perform. In fact many of the statements from pilot teachers regarding the possible achievement status of children were contradictory and so not useful in decision making relative to placement of content objectives. The following comment in the Conceptual Design section of the Curriculum Guide Elementary School Mathematics(1977) also alludes to the lack of surety with regard to the mastery of



concepts as currently placed in the program.

The extent and method of development of each topic will remain the decision of the individual teacher, taking into consideration the abilities and background of each child. As a core program the objectives outlined are those which would normally be covered in a six-year period. However flexibility with respect to applying program objectives to individuals is important. (p.9)

## B. STATEMENT OF THE PROBLEM

The problems upon which this study will focus are outlined below:

1. To what extent are students in grades one to six demonstrating achievement of the mathematics objectives which are outlined for their respective grade levels?
2. Will there be any significant change in the number of students achieving to the 85% level between the 1978 and 1979 testing of objectives in each of the Number, Operations and Properties, Measurement, Geometry, and Graphing strands, in Grades one to six?
3. What do teachers attribute low achievement scores of Zone One students to?
  - a. A lack of good materials for teaching certain objectives?
  - b. Textbooks do not match the program objectives?
  - c. The program objectives for certain grade level are too difficult?
  - d. The test items are too difficult?
  - e. The varied abilities of students makes instruction difficult?



- f. The sequencing of content in textbooks is inappropriate?
  - g. Keeping track of failures and success and subsequent follow-up is too difficult?
4. Will age of entrance to school, sex, geographic location or membership in public or separate school affect the number of students achieving to the 85% level in each objective of the five strands and at each grade level?
  5. Can computerized print-outs of individual students school and system results be utilized effectively for diagnostic and management purposes?

### C. HYPOTHESIS

The hypotheses which follow are based on some the above problems.

#### Hypothesis One

Eighty percent of the students in Zone One will not achieve to a criterion score of 85 percent or better in 1978 and 1979 on each of the objectives in the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one to six.

#### Hypothesis Two

There will be no significant difference in the percentage of students achieving within the 85 percent or higher category (D) between 1978 and 1979 on each of the objectives in the five strands in grades one through six.



### Hypothesis Three

There will be no significant differences in mathematics achievement between the early and late starters in mathematics achievement in each of the objectives in the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one through six.

### Hypothesis Four

There will be no significant differences in mathematics achievement between boys and girls in 1978 and 1979 on each of the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one through six.

### Hypothesis Five

There will be no significant difference in mathematics achievement between North and South Zone students in 1978 and 1979 on each of the five strands in grades one through six.

### Hypothesis Six

There will be no significant differences in mathematics achievement between Public and Separate school students in 1978 and 1979 on each of the five strands in grades one through six.

## **D. DEFINITION OF TERMS**

### Criterion-Referenced Measures

Criterion referenced measures are those test measurement scores which are used to determine individual pupil status with respect to each mathematics objective in



the Alberta Elementary Mathematics Program. The individual student is compared with the established criteria related to the specific program objectives rather than with other students, or groups of students.

### Criterion Scores

Criterion scores in this study refer to the achievement levels that collective groupings attain in order to be classified as being within one of the four achievement categories. (eg. Category D; 85 - 100)

### Achievement Categories

The population of students within each grade will be grouped into one of four achievement categories on the basis of their mean score attainment on each objective. The four specific categories are as follows. Category A: Below 50%; Category B: 50%-64%; Category C: 65-84%; Category D: Above 85%.

### Early Starters

Early starters are those students who have entered Grade One younger than 6.0 years of age as of September 5. One year was added for each subsequent grade so as to designate the early starters in grades two through six.

### Late Starters

Late starters are those students who have entered grade one older than 6.0 years of age as of September 5. One year was added for each subsequent grade so as to designate the late starters in grades two through six.



## Zone One

Zone One of the Province of Alberta is that area designed as the northern region and within the boundaries as outlined in Figure 1.

### North Zone One

Schools north of and including Peace River School Division were designated as North Zone One. These include parts of Northland, North Peace Separate and Fort Vermilion School Divisions.

### South Zone One

All schools south of the Peace River School District and in Zone One are considered as South Zone One participants. The systems in this area include Fairview, Spirit River, South Peace Catholic Authorities, High Prairie, East Smoky, and the Grande Prairie School jurisdictions.

### Public School Students

These students attend non-sectarian schools which are operated by publicly designated boards.

### Separate School Students

Separate School students attend schools which are operated by boards designated as Roman Catholic by faith.

## **E. SIGNIFICANCE OF THE STUDY**

As with most new Programs of Study the progress toward full implementation appears to move slowly. There are perhaps many conditions which tend to impede successful



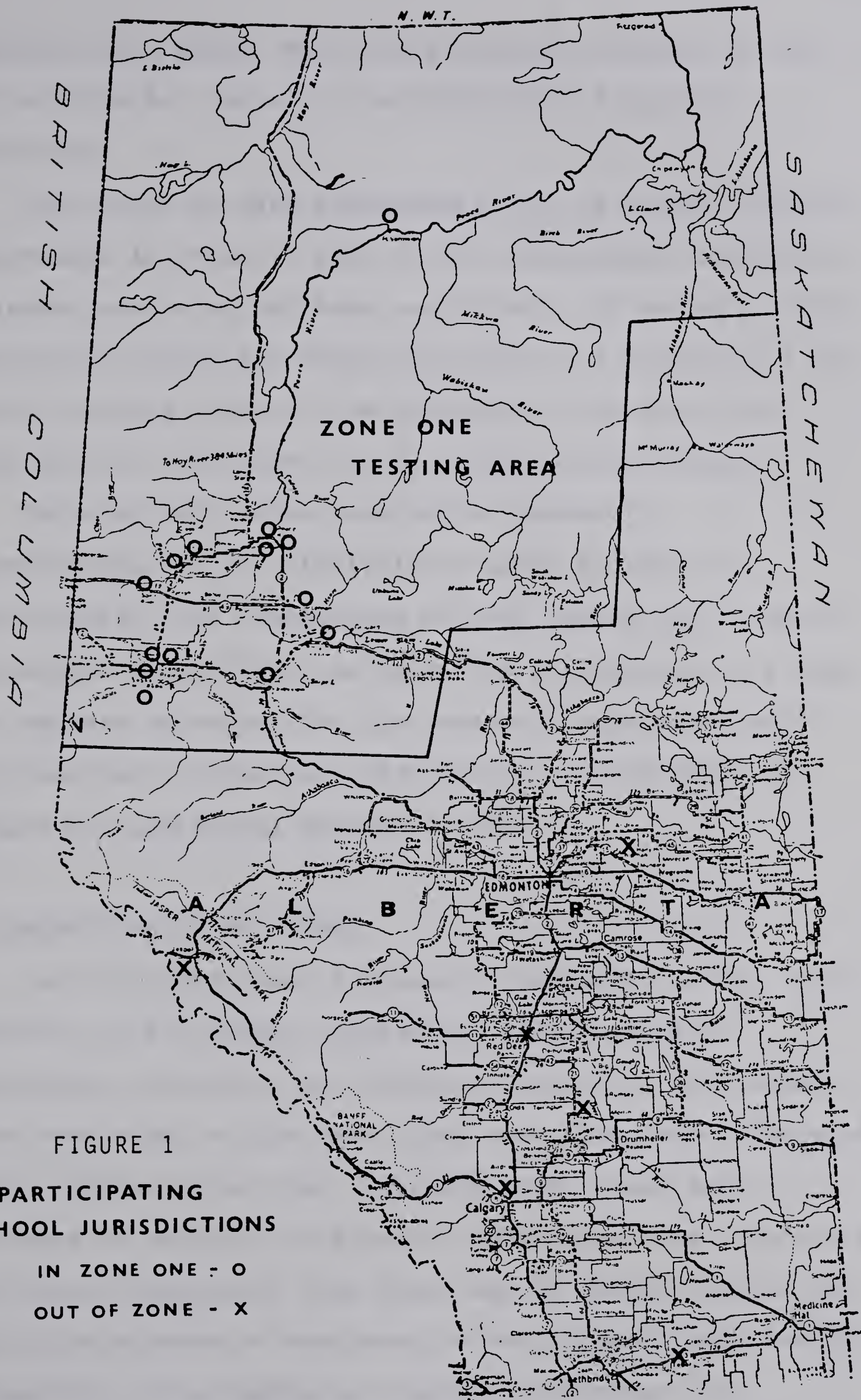


FIGURE 1

PARTICIPATING  
SCHOOL JURISDICTIONS

IN ZONE ONE - O

OUT OF ZONE - X



implementation plans. This study centers primarily on one of the contributing factors; the difficulty of content objectives.

The intent of this investigation is to examine student achievement in terms of each of the mathematics objectives in grades one to six of zone one schools. If certain of the mathematics objectives within the scope and sequence of the current program appear to be misplaced, they should be identified for the sake of both students and teachers.

The study will also examine the teacher's interpretation of the difficulties which students are experiencing. This combination of both teacher and student information may provide the basis for any corrective action that appears necessary for the eventual implementation of the elementary mathematics objectives in the Program of Studies for Elementary Schools (1978).

#### F. LIMITATIONS OF THE STUDY

The interpretation of student achievement within each objective of the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in this study rests completely on the test items that have been referenced to the program objectives. Although these items were validated to measure the specific objectives, the vocabulary and form of particular test items may be biased towards the particular stances of textbooks or the instructional designs of teachers. No attempts were made to counteract or



complement the instructional approaches used in the textbooks nor to check for the instructional preferences of teachers in their handling of the mathematics concepts.

There are other factors which could have an effect on pupil achievement and which were not considered in this study. For example, the amount of time which schools devote to mathematics and the variance in pupil attendance may account for some of the achievement differences. Neither was the effect of teaching on achievement taken into account.

Also, this study does not claim to evaluate the total scope of mathematics learning. As Suydam (1978) says "evaluation in the mathematics classroom consists of much more than a testing program involving pencil and paper" (p. 3). The measurement of computational skills and specific mathematical processes is but one aspect. Other goals such as those related to the student's behavior towards mathematics are equally important. Thus a major weakness of this study would be that it is concerned primarily with the cognitive aspects and not with the affective factors of student performance.

Finally, although it is somewhat limiting to focus on one aspect of evaluation there may be no other way. As Hersom (1974) suggests, if one is to concentrate on pupil assessment then the curriculum development and implementation factors should not be evaluated within the same context. They are the accepted givens. This study does focus on pupil assessment, although there are attempts to



implicate the processes of curriculum development and implementation.



## CHAPTER II

### REVIEW OF RELATED LITERATURE

A study such as this which deals with testing for assessment, diagnostic and evaluation purposes necessarily involves many topics which are related to the subject area in question. The literature review which follows will consider some of these topics, most of which fall within the historical, psychological and sociological aspect of teaching and learning in mathematics. Of particular relevance to this study are the present concerns for assessing students for 'basic' competencies. This is reflected in the mandates given to the Minister's Advisory Committee on Student Achievement (MACOSA).

#### A. BACKGROUND

In recent years there has been an increasing amount of criticism of the mathematics curriculum that reflects both school and public disillusionment with the mathematics that each has come to know. The gist of public criticism, according to Rappaport (1977) is that "children are unable to solve problems of everyday life" (p.7). Such concerns have led to such cries as 'back to the basics' and 'test for minimum competency'. Gilman (1978) says that until two years ago the latter, minimum competency testing, was unheard of, yet by September of 1977, eighty percent of the American student population were confronted with writing an



examination intended to demonstrate skills 'suitable' for receiving a Diploma.

Schools still disappointed with the 'new mathematics' were understandably skeptical with the latest introductions which talked about such things as objective based content, minimum skills and success centered learning.

In order to better understand or relate to these criticisms perhaps it is necessary to examine a few points from the history of mathematics education. Clear cut dates are unrealistic, however some educators (Trafton, 1975; Rappaport, 1977) have observed three distinct mathematics eras within the twentieth century in which the basic goals of mathematics learning have differed. Rappaport (1977) describes the first period, 1900 - 1935, as the "Era of Traditional Mathematics". The main emphasis during this time was to teach children the skills that would enable them to solve problems in everyday life. The subject labelled arithmetic was thought of as a 'tool subject'. Skill and accuracy were the main goals.

Trafton (1975), discussing the setting for reform in the 1930's, says that the arithmetic programs were beginning to face intense scrutiny. The second period, from 1935 to 1958, grew out of this examination and became known as 'The Meaningful Arithmetic Era'. "The new emphasis was on the why as well as the how" (Rappaport, 1977, p.7). This era was to have students understand the arithmetic concepts and processes underlying the computational skills. The solving



of problems was also emphasized and the content of the program according to Rappaport (1977) was "the same as during the times of Traditional Mathematics; the change was in the psychology of teaching and learning rather than in the content" (p.7).

The third period, 1958 to the present, has been labelled as the "New Math Era" (Rappaport, 1977, p.7). This era was characterized by a change from the top down; from developments in mathematics at the post secondary level to resultant changes in the high school, to the junior high, and in a relatively short time mathematics programs for grades one to twelve. This 'new' mathematics placed emphasis on sets, set operations and a knowledge of number systems. "There was a demand for greater rigor in definitions so that the logical structure of a number system could be understood and applied to the development of other number systems" (Rappaport, 1977, p.8). Although there has been some real criticism of the programs of this era there is little evidence of these programs having any impact on schools. One study revealed that although signs of a changing curriculum appeared in textual material, no dramatic upheaval actually occurred. Their research concluded that in "elementary schools, established time and teacher priorities remain with the historical areas of computation with whole numbers, concepts of number operations, fractions, problem solving and application, measurement with a bare reflection of geometry" (Lenchucha, 1978; p.3)



Presently there is some evidence to suggest that we are in a new era or perhaps one that is a make-up from those of the past - The basics of mathematics. To date however there appears to be little agreement as to what constitutes the basics. Educators themselves disagree, not only between but within subject areas.

Basics can be defined very broadly to include such personal aspects as needs for self esteem, worthwhile experiences and significant others who are to be make sense out of the conglomerate of student experience.

For mathematics, some view basics as involving primarily the four operations of addition, subtraction, multiplication and division. Others would include the developmental aspect of numbers such as being able to classify and order objects of various size, shape or consistency.

The National Council of Supervisors of Mathematics Position Paper on Basic Mathematics Skills lists ten skill areas that they say students will need in order to function properly in today's society: (1) Problem Solving, (2) Applying mathematics in everyday situations, (3) Alertness to reasonableness of results, (4) Estimation and approximation, (5) Appropriate computational skills, (6) Geometry, (7) Measurement, (8) Reading, interpreting, and constructing tables, charts and graphs, (9) Using mathematics to predict and (10) Computer literacy (Smith, 1978, p.25).



Smith (1978) makes seven recommendations that are directed to those considering the establishment of a minimum competency (M.C.) program in mathematics.

1. Establish M.C. objectives that address a wide range of mathematics concepts, skills, and generalizations.
2. Establish appropriate M.C. that serves as checkpoints at various grade levels.
3. Be certain the mathematics curriculum is designed to help students achieve the minimum competencies. We must not, however allow M.C. attainment to cause curriculum to regress to the pre-fifties level.
4. Include individual performance tests as well as group administered tests in the student assessment program.
5. Clarify the role of hand calculators in the educational process.
6. Be prepared to implement remediation programs for those students who fail to demonstrate certain competencies. This preparedness includes a financial commitment.
7. Integrate topics in consumer mathematics throughout the K - 12 curriculum - even for the mathematically talented (p.26).

Chaplin (1978) lists three dangers for aiming instruction at the 'minimums'. First he says there is a danger of teaching isolated skills rather than conceptual wholes. Secondly, teaching towards minimum standards results in the practice of teaching towards the test rather than for growth. Thirdly, he says that thinking minimums "leads to



emphasis on actuality rather than possibility" (p.25).

Macdonald (1972) adds another perspective in his address to competency based teaching:

This behavioral approach is primarily in tune with a general technological rationale that exists in our society, and it is now being applied to human engineering problems. The people who are interested in this approach are primarily interested in control. They wish to control the behavior of others for the achievement of goals they believe in. This is a mechanism, a potentially powerful technique, and I have a number of reservations and objections to this approach (p.2).

There are other aspects of today's society besides the concerns for basics and minimum competencies that have relevance for the evaluative nature of this study.

## B. A CHANGING SOCIETY

Tyler in his introduction to the Crucial Issues in Testing (Hunt and Randhawa, 1976) points out that major shifts in today's labor force are in essence responsible for a changing emphasis in education. Fewer people are actually engaged in producing and distributing material goods while more than sixty percent are involved in furnishing non-material products such as health, education, recreation and administrative services. This has led Tyler (1976) to say of schooling: "The critical task is no longer to sort students but rather, to educate a much larger proportion of students to meet current opportunities" (p.3). He suggests that this reemphasis in schooling has in part caused changes in evaluation ideas. For example, failure to learn is now



regarded not so much as a problem of native limitations of the student but more the result of inefficient learning strategies (Hunt, 1978).

Tyler suggests that we not only be concerned with the 'what?' but the 'why?' of evaluating students. He recommends that evaluation systems concentrate more on the information that leads to program effectiveness and less on the test scores that compare pupils. Figure 2 illustrates many of the possible responses to the "why" of evaluation.

The specifying of appropriate mathematics aims, goals and objectives is one purpose for evaluating.

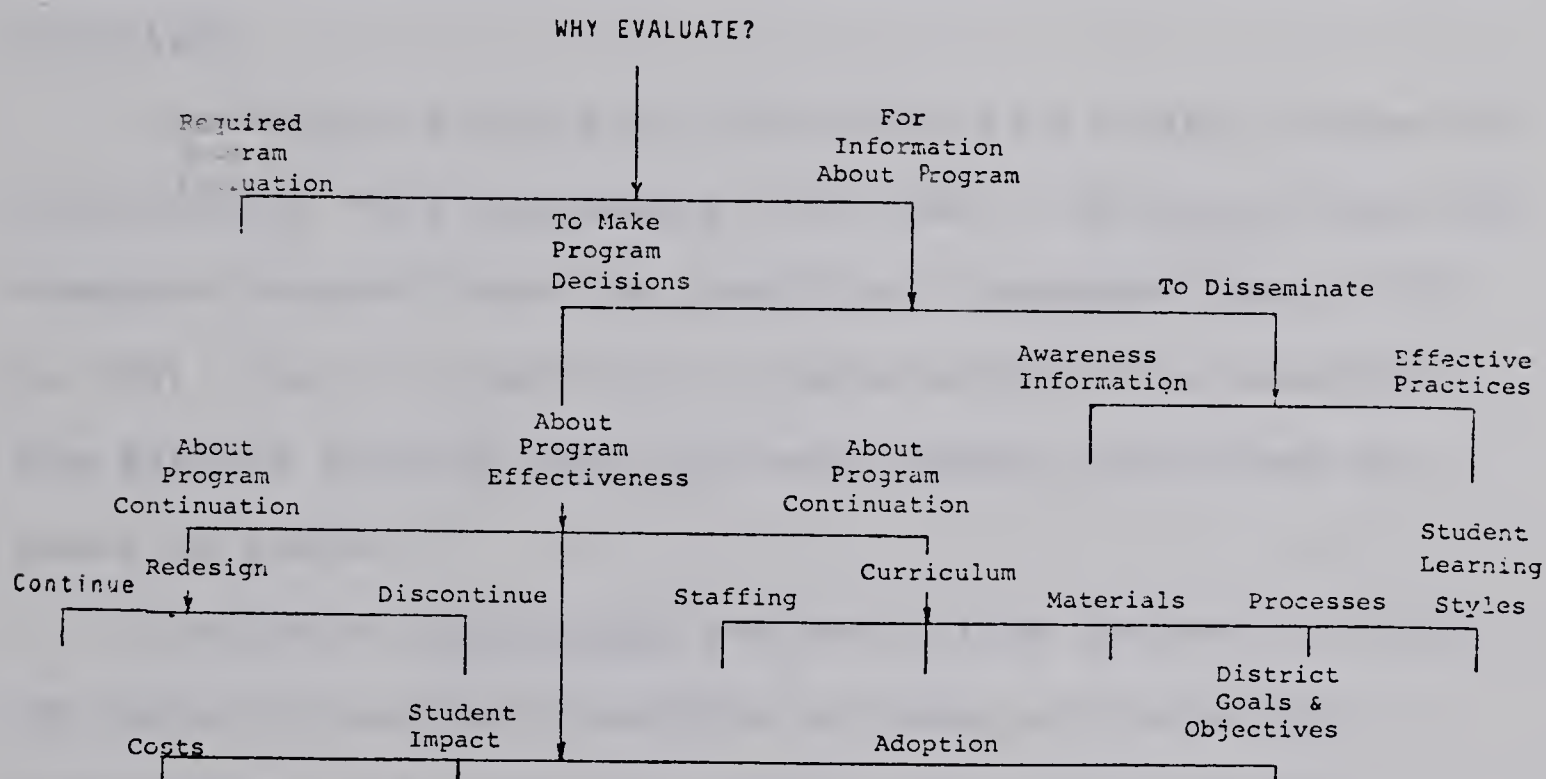


FIGURE 2

A CHART FROM "WHY EVALUATE? ...  
THE EVALUATORS DILEMMA"- Hunt(1978)



### C. AIMS, GOALS AND OBJECTIVES

One of the necessary steps in the development of any educational program is that it be founded upon agreed to aims, goals and objectives.

Robert Zais (1976) makes an often overlooked distinction between the terms aims, goals and objectives. He says that "curriculum aims are statements that describe expected life outcomes based on some valued scheme either consciously or unconsciously borrowed from philosophy" (p. 306). The distinct quality of aims is that they, in contrast to curriculum goals and objectives, do not relate directly to school or classroom objectives (e.g. self realization). The Elementary Mathematics Guide substitutes the word goals for aims.

Curriculum goals most often vary as to their degree of specificity, "but in general will tend to be long range and somewhat removed from the immediate classroom" (Zais, 1976, p. 306). (e.g. to develop an appreciation of mathematics.) The Alberta Program uses the term General Objectives in place of goals.

Curriculum objectives are most often defined in terms of the most immediate specific outcomes of classroom instruction. The concepts, skills and understandings outlined for each of the elementary grades are in objective form.

Zahorik (1976) outlines six dimensions of objectives which have implications for this study. The dimension of (1)



substance concerns the specific categories of learning to be acquired. One set of categories is content, process and values. Content itself consists of facts, generalizations and concepts; process consists of the academic skills and abilities as well as personal-social skills and abilities. Values consist of feelings, emotions and appreciations. The second dimension is that of (2) level which focuses on the complexity of the behavior called for in the objective. Low level objectives call for relatively simple behavior such as that required in demonstrating mastery of the basic facts. Higher level objectives call for such actions as problem solving behavior. Another dimension is that of (3) focus. This aspect deals with the breadth of an objective. An objective can have a narrow focus such as on an independent skill or it may be a dependent or hierarchical concept. The dimension of (4) form refers to how the objective is stated. Three forms which Zahorik (1976) lists are behavioral, conceptual and topical. Conceptual objectives are stated as concepts or generalizations and relate to content, process or value. A topical objective outlines a specific subject matter topic such as "Reads and writes decimals to tenths." The behavioral objective involves all six dimensions so follows a description of the time dimension. Another dimension is (5) the target. It is concerned with whom the objective was designed for. The objectives of the elementary mathematics program for example have grade level as target.

The final dimension is (6) time. Here the question is



when the objective is to be achieved, after an instructional session or by the end of the school term.

A behavioral objective according to Zahorik (1976) "Involves a narrow focus, a pupil as target, and an immediate time period, exploring any type of substance at any level of complexity" (p. 10). In contrast a general objective he says, while dealing with any kind of substance or any level, has a broad focus, a remote time period, either the pupil or the teacher as the target, and is of topical form.

Bell (1976) outlines a typical set of mathematics goals which are intended to reflect not only interest in the attitudes, skills and understanding of students but in processes of learning and the needs of society.

1. The mathematical learning process comprises content learning
  - the learning of concepts and relationships
  - the learning of facts and skills, and process learning
  - the learning of general mathematical strategies (e.g. problem solving, ...)
  - the development of critical and creative powers in a mathematical context.
  - the development of a general appreciation of the nature of mathematics and of its applications in the world and of positive attitudes towards it. (p. 3)

Beggs (1973) speaks of educative learning as involving subject matter or content learned, the process used by the learner as a result of his learning activities and the goal of transfer. He says that the content is a means not an end, in fact, "the intent in learning is to change the learner so



that he is more able to cope effectively and automatically with novel situations" (p. 3).

Some cautions have been expressed for placing too much emphasis on the objective statements in mathematics programs. Zahorik (1976) suggests that the nature of objective statements is such that all aspects of learning should be predictable. This, he says, "is not always possible" (p. 9). Also some areas such as affective learning while considered important cannot easily be placed in objective terms. He suggests further that "behavioral objectives overemphasize simple learning and evaluation" (p. 9). Eisner (1977) says that "one symbol system cannot provide the richness of view that we need. The assumption to provide an unbiased objective description of what children learn and what teachers teach by measuring which objectives have been reached may lead us to accent the part for the whole" (p. 621). "In Education", he says, "we need to catch many fish but we have used nets that let many of the most interesting ones get away" (p. 621).

The Recommendation and Perspectives for School Mathematics from the National Advisory Committee on Mathematical Education (NACOME) contains perhaps the most comprehensive suggestions for those associated with mathematics education. Five of their recommendations are applicable to this study and are summarized as follows:

#### Recommendation 1 Anti-Dichotomy

In the creation, introduction and support of mathematics programs, neither teachers, educational



administration, parents, nor the general public should allow themselves to be manipulated into false choices between the old and the new mathematics, skills and concepts, the concrete and the abstract, intuition and formalism, structure and problem solving, and induction and deduction. The core of every mathematics program should contain a judicious combination of both elements of each pair with the balance, proportion and emphasis between them being determined by the goal of the program and the nature, capabilities and circumstances of the students and teachers.

### Recommendation 2 Quality Education

Every child is entitled to the mathematical competencies necessary for daily living, but the content and essential "basic skills" must be defined to include computational skill as well as ability to deal intellectually with statistical information, to reason logically, and think critically. Minimum skills cannot be allowed to become ceilings of performance for any youngster. Provision and support of equality backers is primary to the accomplishment of these goals. Teachers of mathematics should continue to be supported within their school system by qualified resource specialists in mathematics curriculum and instruction.

### Recommendation 3 Curriculum Content

Curriculum content cannot be viewed as a fixed set of goals or ideas; with this in mind, no definitive curriculum can ever be recommended. But as reasonable and essential features of a contemporary mathematics curriculum it is recommended that: Logical structure should be maintained as a framework for the study of mathematics. Concrete experiences should be an integral part of the acquisition of abstract ideas. The opportunity should be provided for students to apply mathematics in as wide a realm as possible - in social and natural sciences, consumer and career - related areas and real life problems.

### Recommendation 5 The Affective Domain

Positive attitudes and expressions on the part of parent, teachers and the general public with regards to mathematics are fundamental. The affective as well as the cognitive domains in mathematics should be the subject of constant programatic action; basic research into the affective domain be specifically vis-a-vis mathematics should be pressed, and;



attempts to create more appropriate and sensitive instruments for assessing the affective domain should be mounted.

#### Recommendation 6 Evaluation

NACOME recommends that all evaluation instruments be selected after program or individual goals are identified and that they be matched to these goals; that grade-level score reporting on standardized tests be made to develop objective directed tests to replace the norm - referenced tests now commonly used (pp. 16-19).

The final recommendation concerns the primary objective of this study; evaluation and testing.

In her publication Evaluation in the Mathematics Classroom Suydam (1974) stresses the importance of knowing the directions of programs and the use of evaluation activities to determine whether or not these directions are being followed.

In the study of mathematics a student must learn facts, develop concepts, use symbols, and master processes and procedures. But he should also learn to develop generalizations and to sense the presence of mathematical ideas and structure not only in the abstract situations but also in many areas of human activity. He should develop his reasoning powers in order to prove or disprove a statement by deduction or to predict an event with appropriate probability. It is the function of evaluation to determine how well a student has mastered these varied aspects of mathematics (p. 5)



#### D. EVALUATION AND TESTING

Dyer (1967) says that an educational instructional goal can be defined "only in terms of the agreed upon procedures and instruments by which the attainment is to be measured" (p. 129). These procedures refer to the utilization of various forms of testing, measurement, assessment and evaluation systems. Figure 3 is included to illustrate how one may distinguish between these terms.

Tyler (1974) suggests that the changed emphasis on providing meaningful learning programs for students has been, in part, responsible for such instructional models as Mastery Learning, Individualized Instruction and Performance Contracting. Accordingly, he says, we find a changing emphasis on student evaluation.

For example, the evaluative aspect of an instructional strategy such as mastery learning holds to the idea that most students can be brought to certain criterion levels of performance in specified subject areas. This particular emphasis in turn carries with it a need for new strategies in educational evaluation. A comparison of norm-referenced and criterion-referenced testing will illustrate this point.

Norm-referenced evaluation is used to ascertain a student performance against the performance of other students on the same measuring instrument. It is obvious that norm referenced scores have meaning only as they compare with the scores of other individuals who took the same test. Hunt (1976) suggests that the average level of



	MEASUREMENT	ASSESSMENT	EVALUATION
Purposes and uses of tests	Prediction	Prediction	Prediction
	Certification	Classification (certification)	Certification
	Experimentation (control of effects of testing)	Experimentation	Experimentation
	Normative and Criterion based tests.	Emphasis on effects of measurement/effective functioning under testing conditions.	Utilization of effects of testing, operational definition of objectives, motivation of students, motivations of instructors.
	Summative and/or formative judgments.	Diagnosis and prognosis with respect to criterion situation.	Summative judgments.
Educational Implications	May be used as one source of information by either assessors or evaluations.	Attempts to define syndrome and determine underlying causation. Most frequently used in formative efforts.	Diagnosis with respect to attainment of objectives as they relate to educational and/or social values.
	External pressures and may result in some changes.	Revision coincident with the observation of relations between diagnosis, prognosis and performance.	Revision coincident with the relationship between overall performance and aims, and relevance to values, which may vary with clients.
	Implies what a teacher does is relatively static.	Attempts to assess what a teacher and student does in a life situation.	Attempts to determine the amount of educational change effected.
	Formal techniques geared to curriculum content, subject matter, texts, lectures, etc..	Any type of educational experience relevant to performance in a criterion situation.	Any type of educational experience that will foster achievement of objectives.
	Surveys conducted by an external agency.	Appraisal directed by assessors.	Evaluation directed by evaluators.
Emphasis in Testing	Comparisons of schools over space and time.	Feedback to learner and teacher.	Effectiveness in terms of implicit or explicit objectives.
	Quantitative description of individual with respect to normative population.	Qualitative description with respect to effective functioning or to overall functioning. (N.B. Quantitative measurement sometimes used in order to get at qualitative e.g., temperature)	Quantitative and qualitative description with respect to implicit or explicitly stated values either education or social - objectives, goals, aims.
	Assumption of a stable world and stable characteristics of individuals.	Present equilibrium of trends and behavioral tendencies inferred from dynamic analysis.	Constantly changing world, changing characteristics of individual.
	A single sampling of behavior of one aspect of behavior.	Many aspects of behavior assessed over a period of time.	Several aspects of behavior examined at one time.
	Development of standard instruments.	Development of instruments for specific situations through a variety including standardized instruments.	Development of specific instruments or use of standardized tests if they match the behavior objective.
Data-gathering Techniques	Objectivity and reliability (validity secondary).	Validity (objectivity and reliability secondary).	Validity (objectivity and reliability secondary).
	Usually paper and pencil or any method which yield objective evidence.	Any device which will yield relevant evidence.	Any device which will yield relevant evidence.
	Objective.	Subjective with lesser degree objectivity.	Objective and subjective.
	Accuracy and/or speed of response - single sampling.	Process of responses, total responses.	Pattern of responses and all relevant responses.
	Addition or summative combination of scores.	Attempts to assess process.	Pattern and relating of evidence between scores and process.
Scoring and Interpretation of Test Results	Interpretation in relation to group norms, either of an individual or a group.	Interpretation in relation to functional hypotheses	Interpretation in relationship to objectives.

FIGURE 3

## CHARACTERISTICS OF MEASUREMENT ASSESSMENT, AND EVALUATION - Jenkinson (1979)



performance of the group becomes the reference point about which the measurement scale is anchored. The comparative scale becomes a function of the distribution above and below the average. Ebel (1971) adds that measurement systems have taken this route "since the model adopted in psychology was the individual difference model which implies comparisons among individuals" (p. 17). An assumption in norm referenced testing (NRT) accordingly is that individuals differ and the results should be a reflection of these differences. Hunt (1976) adds two additional assumptions about NRT. One is that "high marks must never occur on test results and the second is that some failures must always occur" (p. 7).

Most evaluative systems up to the early 1960's appeared to concentrate on the comparison aspect until Glasser (1963) introduced the term criterion-referenced testing (CRT) somewhat in opposition to norm referenced forms. Glasser and Nitko (1970) defined a criterion-referenced test as "one that has been deliberately constructed so as to yield measurements that are directly interpretable in terms of specified performance standards" (p. 630). In this system the performance of a student is now determined by his own skills and is not dependent upon the performance of his peers.

Hambleton (1978) reports that today criterion - referenced tests are used to monitor individual progress in objective based instructional programs, to diagnose learning difficulties, to evaluate educational and social action



programs, and to assess competencies in various technical and certification programs. He also points out that until quite recently (Glasser and Nitko, 1971; Harris, Alkin and Popham, 1974), there have been few reliable guidelines for test construction, test assessment and test score interpretation and that this in turn has hampered the effective use of criterion-referenced tests. Confusion also exists over the use of the terms according to Hambleton (1978). "There are more than 600 references on the topic of criterion-referenced testing, unfortunately, it seems that there are almost as many ideas about what a criterion referenced test is as there are contributors in the field" (p. 2).

One of the major sources of confusion appears to be over the word criterion. For many it refers to a performance standard, a minimum proficiency level, or a cut-off score. However (Hambleton, 1978; Popham, 1975) seem to indicate "that the use of the word criterion should refer to a domain of behaviors" (Hambleton, 1978, p. 2). Hambleton (1978) in fact accepts the definition of the criterion-referenced test stated by Popham (1975). "A criterion-referenced test is used to ascertain an individual's status (referred to as a domain score) with respect to a well defined behavior domain" (p. 2).

There appears to be further confusion over the differences among three somewhat related tests -- criterion-referenced tests, domain-referenced tests, and



objective referenced tests. If one were to accept Popham's definition there appears to be no difference between the criterion referenced tests and domain-referenced tests. Objective-referenced tests and criterion-referenced tests differ in the following way according to Hambleton (1978). On a criterion-referenced test, the items are a representative set of items from a clearly defined domain of behaviors measuring an objective.

With the objective referenced test no domain of behaviors is specified, and items are not considered to be representative of any behavior domain.

The emphasis on testing lately seems to be on the criterion referenced type. Gronlund (1973) in his book Preparing Criterion Referenced Tests comments on how, besides improving instructional decisions, such tests can aid the learning process by improving student motivation, increase retention, improve transfer of learning, increase student self understanding and promote feedback concerning instructional effect. Gronlund (1977) also outlines five basic principles of achievement testing which are worth noting.

1. Achievement tests should measure clearly definable learning outcomes that are in harmony with instructional objectives.
2. Achievement tests should measure and represent samples of the learning outcomes and subject matter included in the instruction.
3. Achievement tests should include the types of items which are most appropriate for measuring the desired learning outcome.



4. Achievement tests should be designed to fit the particular uses to be made of the results.
5. Achievement tests should be used to improve student learning (p. 7-14).

Popham (1978) lists the following attributes of a well constructed Criterion-Referenced Test:

(1) An Unambiguous Description Scheme that spells out just what it is that examinees who take the test can or cannot do.

(2) An Adequate Number of Items It is technically impossible to get a decent fix on an examinee's status with respect to a particular skill by using only a handful of items.

(3) Reliability and Validity

(4) Comparative Data Normative data that permit education to answer more sensibly the question: "How good is good enough?" should be available (pp.93-94).

The most significant questions surrounding the issues of testing are perhaps those which are why and how tests are to be used. Educators at all levels, from the classroom to the Department of Education, who are involved in curriculum and instructional decision-making should be concerned about such questions.

Nyberg (1977) requests a new look at testing procedures.

As achievement testing, propelled by the "back to the basics" movement, returns to the educational scene it is most important that everyone concerned with schooling put forth an effort to share a new structure. We must not think in terms of returning to something that existed in the past, rather we must look to producing a system that fulfills purposes determined on a national basis (p. 18).



He expounds the need for an evaluation system that does not consider measurement as an adjunct to teaching but as an integral part of the educational process. "Without some sort of measurement (I did not say formal test), teaching becomes a matter of hit or miss at best, and sheer chaos at worst" (p. 19). Nyberg (1977) considers testing to be an integral part of curriculum because of its benefit in decision-making; decisions by teachers, counsellors, students and parents. Most Alberta educators are concerned that we not go back to the province-wide Department of Education testing. However, there appears to be a renewed interest for Provincial involvement of some sort. The MACOSA studies and the current involvement in 'Power Testing' is an indication that the department is not reluctant to act in this area.

A testing system that would avoid the old pass-fail stigma and still provide the basis for the monitoring of achievement and decision-making regarding the strengths and weaknesses of pupils appears to be of the most interest. This of course is a big request.

The overall emphasis of an achievement monitoring program would be to make instruction more effective. At the classroom level, teachers would have early in the school year, information on the strengths and weaknesses of each pupil. At the curriculum decision-making level both local and provincial working committees would have data revealing long-term trends in achievement, and data that could be useful in curriculum research (Nyberg, 1977, p. 21).



Concerning this latter aspect Hersom (1974) writes that the praxis of curriculum evaluation is seldom characterized by the linearity and logical sequencing portrayed by theoretical models. One result of this is that the curriculum evaluation component is either ignored entirely or else associated solely with product or outcome questions (p. 100).

Curriculum evaluation practices have, in fact, varied in their approaches towards accounting for curriculum decisions. There are several stances which appear to be open in this regard. One is to abdicate the evaluator's responsibility for making judgements altogether and to emphasize his role as an information provider for decision makers (Shuffleheam, 1971).

Another is to focus on the observable, measurable behaviors of students (Popham, 1973). Still others recognize that "curriculum evaluation is political in nature and that decisions are derived from biased origins which should be taken into account" (Hersom, 1974, p. 101). Greenbaum (1977) says that

serious consideration must be given to the differences between evaluation which can produce relatively immediate and real improvement versus those that can produce meaningful symbols which might lead to progress only in the future, versus that which have little direct utility or positive symbolic value but which become excuses for existing inadequate conditions" (p.3).



## E. MATHEMATICS ASSESSMENTS

Another indication of the current interest in the basics of mathematics learning is reflected in the emphasis given to assessing the competencies of students.

Robitaille (1977) says that the principle that underlies any learning assessment program is that "decisions about education should be based upon knowledge of what and how students are learning "(p. 6). Four major functions of assessments can be drawn from the 1977 British Columbia Assessment report: (1) To assist school districts in maintaining and identifying strengths and weaknesses of programs; (2) to provide curriculum development and revision committees with data for the improvement of curriculum; (3) to provide the basis for the development and allocation of resource material at both the provincial and district levels; and (4) to provide useful information to university level institutions that will indicate directions for change and improvement in teacher education"(Robitaille, 1977,p. 6).

The First National Assessment of Educational Progress in the United States, conducted during the 1972-73 school year, studied the knowledge, skills, understanding and attitudes of four age levels (9, 13, 17 and adults - ages 26-36). A three-dimensional classification scheme was used to categorize the mathematics objectives studied. These dimensions were the Uses of Mathematics , the Content of Mathematics and the the Cognitive Objectives or Abilities



dimension (e.g. to recall and/or recognize definitions, facts and symbols). An overview of the results showed the following for nine year olds (Approx. 25% Grade 3, 75% grade 4).

1. The performance on simple numeration tasks such as recognizing place value, counting by tens, or writing numerals was "quite good" for 9-year olds.
2. Acceptable performance was found on exercises measuring knowledge of number properties and operations.
3. Students handled addition problems well, but they did poorly on the other operations.
4. Successful performances were reported on simple problem-solving tasks requiring reading (or listening to) a verbal statement of a problem, selecting a whole number operation and appropriate data from the statement and obtaining the answer by computation.
5. Students showed reasonably good performance on numeration concepts such as recognizing a digit in the tens place of a four digit number, selecting the verbal translation of a three digit number, counting by 10's, selecting a translation from words into symbols and determining odd or even whole numbers.  
 Most (85%) of these students could order a sequence of six whole numbers.  
 Students had difficulty with the 0 property such as in  $3 \times 0 = 3$ .
6. The data for this group (9 year olds) indicate that computational skills have not been mastered.
7. Only a small percentage of the 9 year olds showed knowledge of elementary fraction concepts.
8. Most nine year olds could recognize and name basic plane shapes such as circle, rectangle, and triangle, but few were familiar with the terminology for diameter of a circle, parallel lines or right angle.  
 (Results from the First Mathematics Assessment, NCTM, 1978, pp. 14-89)

The British Columbia Mathematics Assessment

(Robitaille, 1977) tested over one hundred thousand



students from Grades 4, 8 and 12 on their degree of mastery of "a limited number of important mathematical skills and concepts" (p. 8). Although students were evaluated at the three levels indicated, results were to coincide with the end of primary education (Grade 3), end of elementary (Grade 7) and end of public schooling (Grade 12). Test results were judged by Interpretation Panels consisting of educators, school trustees and members of the general public. The mathematics assessment items numbering sixty nine were geared to measuring student mastery of ten objectives in three domains; Computation and Knowledge, Comprehension, and Applications of mathematics.

Satisfactory performances by grade 4 students were exhibited in the following areas: ability to add, subtract, multiply and divide, knowledge of symbols and terminology, geometric concepts and problem solving. Less than completely satisfactory performances were found in subtraction of whole numbers involving regrouping. Poor achievement ratings were found for student comprehension of fraction concepts and the metric system of measurement. Older students outperformed the younger, female students did better than males in computation while males outperformed females in problem solving.

The Edmonton Grade III Achievement Study: 1956-1977 Comparisons (Reading and Mathematics) was commissioned



in the spring of 1977 over "public concern about standards of school achievement" (Alberta Education Report, 1977, p. i). This study involved all the Grade III students in the Edmonton Public School system. Thirty five hundred students were tested in May of 1956 and the same instruments reprinted for the May of 1977 re-testing (4500 students). Because of the twenty-one year time difference, various educators were asked to examine each test item to determine its appropriateness for the 1977 student. A total of 12 arithmetic items were identified as not appropriate, and as such were eliminated from the instrument. The original California Achievement Tests of Arithmetic from 1956 were re-scored so as to be comparable to the 1977 results.

This study reported that the average score made by the Grade III students in 1956 was 55.98. The corresponding score made by Grade III students in 1977 was 55.56. This difference of 0.42 represents a one percent decrease in performance from 1956 to 1977, not a significant difference. Indeed the researchers for the Grade III study suggest that the change in curriculum emphasis during this time would more than account for this variance.

The Minister's Advisory Committee on Student Achievement (MACOSA) for Alberta was established in November of 1976 to study the problems related to student achievement in Alberta and make recommendations



for their solution. The Alberta Assessment of School Mathematics , was one study assigned by this group. The results (Olson, Sawada and Sigurdson, 1979) like the B.C. Assessment data, were filtered through an Interpretation Panel.

A technique known as Matrix sampling was used in this study whereby both students and text items are sampled. The design is such that not all students wrote all of the items in a given test battery but rather a grouping of approximately twenty items each. Students also were tested on three types of items. Preview items were those which were given at a division lower than where they would normally be taught. They "provided preview information on that content" (Olson, et al, 1979, p. 3). Target items were those which covered material that would normally be taught at a division and thus were given at that particular division. These items were to provide information on how well students were performing at mathematical concepts and skills specified for their level by the Alberta Program of Studies. The third type of items were the Review type. Items of this class were given at a division higher than target with the intent that information on how well students performed on material they should have mastered at least three years earlier should be available. The MACOSA report outlines findings in five main areas that concern the elementary grades specifically.



## Number

At the Division I level strong performances were obtained on the fundamental skills of primary school mathematics - percentage scores ranging between 91 and 98 were given on items dealing with cardinal number of a set, reading 3-digit numbers, counting by tens, ordering 4-digit numbers, and the basic facts of addition and subtraction. Rather weak performances were obtained on exercises dealing with rational numbers ... performances ranged between 11% and 72%. At the low end were simple decimal tasks that 0.3 be read as three tenths, and at the high end were tasks dealing with recognizing common fractions.

At Division II the strong start made on the fundamental skills continued with performance in the 90's given on exercises dealing with basic facts of multiplication and division, adding and subtracting and multiplying multi-digit numbers, reading 5-digit numbers, and rounding to the nearest tenth. As with Division I, the work with rational numbers was weak both in common fraction form or decimal form. Performances with integers were low.

## Algebra (The Operations and Properties)

In Division I over 80% of the students showed an understanding of the use of the box " " in a simple algebraic sentence while two-thirds of them could translate an English statement into a sentence containing a box. One third of the students understood the concept "more than" and the accompanying symbolism ">". By Division II, two-thirds of the students were using this idea of inequality correctly. The focus of Division II algebra was verbal problems. Simple problems containing 3 or 4 sentences and one or two operations were answered correctly by less than 75% of the students.

## Geometry

Students appeared to do well on topics in geometry that receive emphasis in schools. Performance levels for example were relatively high on the following topics: angles, triangles, circles and congruence. In contrast, the following topics were not handled nearly as well: similarity, line relationships (parallelism and perpendicularity), and polygons. Other weak areas, probably because of a lack of exposure, were transformations and symmetry.

## Measurement

The telling of time, figuring with money, and measuring



length had strong beginnings in Division I and rose to 90% performances.

Division II. Questions on perimeters, area, and volume fared less well. Performances dealing with the interrelationships among length, area and volume were particularly low (30% - 40%).

#### Statistics (Graphing)

Division I scored high on picture graphs and about 40% on line graphs with only one-third able to construct a bar graph.

Division II did well on the bar graph and line graph and 50% on the circle graph.

One of the difficulties in the Alberta Assessment of School Mathematics centers on the terms used to describe acceptable levels of achievement. A satisfactory achievement score for one grade level often became unacceptable for students at another grade even though the interpretation panel and researcher ratings with regards to what constitutes satisfactory or unsatisfactory performance did not agree consistently. This will make meaningful reporting and follow up a difficult task.

#### F. REGIONAL DIFFERENCES

Burger (1974) examined the relationship between geographical isolation of a school and pupil alienation in the Northland School Division which is included in Zone One in the current study. He used Seeman's (1959) five dimensions of alienation which were:

Powerlessness - "The expectancy or probability held by the individual that his own behavior cannot determine the occurrence of the outcomes or reinforcements he seeks."

Normlessness - "A high expectancy that socially unapproved



behaviors are required to achieve given goals."

Meaninglessness - "A low expectancy that satisfactory predictions about future outcome of behavior can be made."

Self-estrangement - "The degree of dependence of the given behavior upon anticipated future rewards."

Isolation - Assigning low reward value to goals or beliefs that are typically highly valued in the given society (p.

784-791). Burger (1974) reported t-tests between students in geographically isolated and non-isolated schools that were related to total alienation and the normlessness dimension at the 0.5 level of significance and to the powerlessness dimension at the .001 level of significance. No significant relationship was found between location of the school and the self-estrangement and meaninglessness dimensions of alienation. Burger (1974) contends that the "alienation of students in Northern Alberta is magnified by cultural differences between white teachers and native students, and that little interrelationship exists between the student's school life and community life" (p. 1). Lane's (1967) statement adds support to this position:

... traditional Indian ideas about how learning takes place, what sorts of things are important, at what ages should children learn certain kinds of things, in what way and at what speed, differ significantly from the educational philosophy underlying the federal and provincial school system. (p. 33).

Dumont (1971) studying school withdrawals in the High Prairie School Division concluded that "certain factors which can be identified early in a student's career can be used with a certain degree of confidence to distinguish the potential early school leaver from the potential graduate"



(p. iii). A study group of 97 boys and 84 girls who had left school prior to graduation and a control group of 97 boys and 84 girls who graduated from high school with a high school diploma or senior matriculation were selected for the study. Significant differences were found between the study group and the control group "on socio-economic status, attendance, formal schooling of parents, program offered by the school in which the student is registered, ethnicity and achievement level on the reading English language arts portion of Grade IX examination" (p. iv).

Elkin (1963) a sociologist, says that "children of lower social status tend to be perceived by school personnel as having less ability to benefit from education than children of higher status" (p. 114). He also notes that schools where pupils are predominantly lower status are more likely to be lower in morale and to seek transfer to "more desirable" schools than teachers in schools where pupils are predominantly middle class.

Taylor and Ayres (1972) have collected statistics in North-South differences and titled a book after their findings, Born and Bred Unequal. One of their concerns is with the economic and social factors which affect educational opportunity. Although their setting is England, perhaps some of the findings could apply in Zone One. They list such factors as highest incidence of death rate in the north, housing disparity and unemployment. "The consequences of this inequity are marked in all parts of the educational



system by the age of school buildings, expenditures on schools, length of school life and moving to higher education" (p. 78).

#### G. AGE AND SEX DIFFERENCE

The British Columbia Mathematics Assessment (Robitaille, 1977) reports that at all three grade levels studied, the younger students outperformed their older counterparts. This they say "is not surprising since many of the older students at each level have been progressing through the system at a slower than average pace because they are less capable academically" (p. 35). In examining this phenomenon further however they found contradictory evidence.

Of greater interest is the finding that, among Grade/Year 4 students born in 1967, there is a relationship between date of birth and achievement. Children born in the first quarter of 1967, that is between January and March, did better on all Grade/Year 4 test objectives than those born between April and December of the same year. In other words, among nine-year-olds, the older children outperformed the younger ones. (p. 35)

The age at which children enter school has been studied from both sociological and educational perspectives. Sociologists are concerned about the effects of early transfer of the home's role to the school. "The earlier the child comes to the school the greater the responsibility of the school as a socializing agency" (Elkin, 1972, p. 113). There may be some negative effects to this transfer of responsibility.



Moore (1975) in Better Late Than Early, a book that grew from research on the young child's mental development gives another concern.

A number of research studies by brain specialists and by psychologists had suggested that the normal child's brain is not ready for sustained learning programs - until he is 8 to 10 years of age. Some specialists doubted even then that he should be forced into school. This was a surprising note, considering the nationwide trends toward early schooling. (p. xv)

Moore (1975) says that there are many factors which should be considered for the student's school entrance age. Moore uses the term integrated maturity level (IML) to encompass the child's maturation in such developmental areas as "vision, hearing, social-emotional progress and the activities of the central nervous system" (p. xvii). Their concerns for early school entrance are in part physiological. Hedges (1977) in attempting to answer the question At What Age Should Children Enter First Grade?, conducted a comprehensive search of the literature including nine dissertations, over two hundred and fifty articles, a number of research reports, and a few reviews of research. He labeled his findings "both startling and disturbing. In a number of instances, the literature cited by writers was limited, at times highly selective in the direction of their biases. In other instances data were either misinterpreted, ignored or overlooked..." (p. xii). He noted a definite swing in the literature. "A few years ago it was unpopular to 'push' a child. In more recent years, the emphasis has shifted toward early intervention and stimulation and even



to the assumption that earlier is necessarily and automatically better" (p.xii). Ames (1967) in his book Is Your Child In The Wrong Grade?, says that "research conducted at the Gesell Institute in the past ten years revealed that at least one child in three may definitely be overplaced and struggling with the work of a grade which is really beyond his ability" (p.3).

With regard to sex differences the Mathematics Achievement Study (Rhodes, 1978) found that on the MACOSA project tests boys do better in mathematics. In the British Columbia Assessment (1977) boys outperformed girls on as many objectives as girls outperformed boys. "In general, the girls were superior on objectives dealing with skills and concepts which were lower on the scale of cognitive behaviors than those on which the boys obtained higher results" (p. 36). Most differences they suggest were very small.

Hedges (1977) looks at both sex and age differences when he writes that:

There is general agreement among researchers, teachers and parents, that small, but clear sex differences in rate of development do exist. Our own clinical impression is that these amount to about 6 months in favor of girls around the time of school entrance. This is why we have maintained that a girl should be, on the average, fully 6 before starting first grade while boys do better if fully 6 1/2. (p.

39)

Carol Jacklin (1979) speaking at the 1979 Diagnostic and Prescriptive Mathematics Conference reported that the consensus of most male versus female mathematics achievement



research is that either there are no differences or boys do better. The evidence also contends however, that "the differences are primarily due to the attitude and treatment differences that are shown within the classroom, the home and occupational environments" (Conference Address).

#### H. THE ZONE ONE STUDY IN PERSPECTIVE

The literature reviewed has pictured the interest that exists for suitable mathematics programs that will serve the best interests of individual pupils and society in general. With this expressed interest has come the call for assessment and evaluation data that will reveal the present skill, understanding and knowledge levels of students at all levels within the schools.

The present study combines the assessment and diagnostic and evaluation aspects of testing in elementary school mathematics in one particular geographical region of the province of Alberta. The assessment component of the study looks at the the individual and collective achievement of students in relation to the stated objectives of the 1977 Elementary Mathematics Program of Studies. The evaluation component of the study examines each of the objectives of the program in relation to how students are performing. The diagnostic aspect of the investigation is concerned with the instructional benefits of providing student achievement profiles to teachers and school supervisors.



## CHAPTER III

### INSTRUMENTATION AND RESEARCH PROCEDURES

#### A. INSTRUMENTATION

##### Zone One Testing Instruments

During the 1976-77 and 1977-78 school terms the Grande Prairie School District and the Regional Office of Education engaged in a test development project. The intent of the project was to produce evaluative instruments that would better match the mathematics objectives as outlined in the new Alberta elementary mathematics program.

Teachers at each grade level were given release time for the purpose of collecting, adapting and creating suitable test items. The final edition of the tests was to include an average of about two items for each objective in the program. With a total of 173 objectives in grades one to six over 350 validated items had to be approved.

Draft copies of grade level tests, upon completion, were referred to teacher committees who were to check for inherent ambiguities, poor readability, inaccuracies or lack of item clarity. A questionnaire (Appendix B) accompanied the draft test booklet in order to assist teachers in their examination of the test material. Suggested changes were discussed with the project coordinators and alterations were made where deemed advisable. Revisions to Grades I to VI tests were made and subsequently administered to approximately ten classes per grade level in the Grande



Prairie Public School system. This was considered to be the first stage in the validation of the tests at each grade level.

### Pilot Testing

The purpose of the initial administration of the Zone One tests was primarily to establish validity of the mathematics items which were referenced to the program objectives. The tests were administered to students according to the schedule as shown in Table 2. Because of the time of the year and the newness of the program the tests were given upgrade; that is, one grade higher than designated.

TABLE 2  
ADMINISTRATION SCHEDULE FOR PILOTING TESTS

DESIGNATED LEVEL OF TEST	GRADE LEVEL ADMINISTERED	DATE ADMINISTERED
Grade I	Grade II	January 1978
Grade II	Grade III	January 1978
Grade III	Grade IV	January 1978
Grade IV	Grade V	March 1978
Grade V	Grade VI	March 1978
Grade VI	Grade VI	March 1978

Teachers' Guides were also produced at each grade level both for ease and uniformity of administration. Teacher directions to students were explicit and detailed to the extent that the reading skills of students would not be a factor.

Marking keys were also produced in order to facilitate



the marking of the tests and to ensure uniformity of scoring throughout the school system. Because the majority of test items were completion, short answer or calculation type, and partial marks allotted for work, these keys were vitally important.

Both teachers and school administrators took an active role in the piloting of test materials. The Teachers' Guide and marking keys received the same scrutiny that the tests were forced to undergo.

The Grande Prairie teachers who piloted the tests with students were actively involved in the revision teams which were assembled for follow-up action on the tests. Their involvement at this stage provided for the second step in the validation process. The knowledge that these teachers had of the students and their perceptions as to why students responded to the test items the way they did, proved valuable. Appendix C contains the pilot data for grades one, two and three students. Forms used to assemble the data are found in Appendix E and Appendix F. Teachers were able to perform a class average with the provision of a special form (Appendix D). The questionnaire form used by the Ad Hoc development committee is included as Appendix A.

Subsequent to the completion of the test materials a meeting with Zone One supervisory personnel was held to inform them of the project. Eventually all Zone One school systems chose to participate in the testing program for a two year trial period.



## B. RESEARCH PROCEDURES

### Data Collection

The revised forms of the Zone One Elementary Mathematics tests were administered in June of 1978 and 1979. These materials, published within the zone, were delivered to the central office of the school jurisdictions with the intent that administrative people distribute the Student Tests, Teacher Guides, Answer keys and Analysis Forms in appropriate numbers to their respective schools in time for an early June testing.

Meetings were scheduled with all supervisory personnel in the zone during May of 1978 for the purpose of involving these people in the administration of the assessment process. At these sessions with Principals, Assistant Superintendents and in some cases Superintendents, various aspects of the testing program were discussed; the design of the tests, purposes for testing and the details of administration were the main topics of these meetings. Informal question and answer type sessions were conducted with central office personnel during the 1979 delivery of materials. These same individuals had attended the 1978 meetings so a repeat inservice was considered unnecessary.

Teachers were required to correct their own students' tests. As mentioned, the marking keys were extensively detailed because of the allocation of partial marks for many of the completion type items. The following comment was



included in the Teacher's Guides at each grade level.

The scoring procedures used for the tests are intended to be simple and yet reflect the difficulty of the test item and the relative weighting of the strands. Total possible scores within the strands reflect the following emphasis.

Number	30% - 40%
Operations and Properties	20% - 30%
Measurement	10% - 20%
Geometry	10% - 20%
Graphing	5% - 10%

(Grade 6 Teacher's Guide, p. 10)

For the 1978 testing the student marks from tests were transferred by teachers to the Question Basis Section of the Student Analysis Form (Appendix F). An optical scanner form (Appendix G) was designed to replace the Student Analysis sheet for the 1979 data collectionn. Teachers were still required to mark and transfer the individual student scores as in the previous year. The optical scanner, however, eliminated the card punching and thus allowed a more rapid analysis of the data. Individual student, school and system computer print-outs were sent out in July of 1979 much earlier than the October shipment of the 1978 profiles.

In addition to transferring student test scores, teachers entered such information as student name, sex, the school and system numbers and the designation of early versus late starters. School and system code numbers were provided in the Administrative Directions (Appendix H) as was the method for identifying the students as early or late starters.



The School Jurisdictions, the number of schools within each system and the population of students within grades are provided in Appendix I. This information applies to 1978 only. The Zone One population of students within the grades of course varied slightly between the two testing years although not enough to be of any concern.

### Scoring Reliability

The following procedure was used in determining the reliability of teachers marking their own students' tests. Six student test booklets from each of grades one, three and six were randomly selected from each of four elementary schools in the Peace River Public School District. These schools administered the Zone One tests in June of 1978, and had been instructed to package and forward the used and unused testing materials to their Divisional Office. The researcher rescored the total of 72 students' tests at the three grade levels. The variation between teacher and researcher scoring shown in Table 3 is not considered significant.

TABLE 3  
COMPARING TEACHER AND RESEARCHER SCORING OF  
TWENTY-FOUR SAMPLE TESTS IN EACH OF THREE GRADES

	GRADE I	GRADE III	GRADE VI
Teachers Scores	89	308	150
Researcher Scores	89	307	148



## Reporting Results

As indicated, computerized print-outs that contained the achievement of individual pupils, the composite scores of students within each school, each school system and total zone were provided. Jurisdictions did not, however, receive each other's forms although all were given print-outs showing total student population, male-female, and early-late achievement profiles of each grade level, both for in and out of zone participants.

## Additional Information

In November 1978 a discussion paper on the topic of mastery learning was sent to each school involved in the Zone One testing project. The contents of the paper included such aspects as the meaning and concerns of mastery learning and the possibilities of mastery programs answering to the weaknesses reflected in the 1978 measurement data. The purpose of the paper was also to provide a basis for a questionnaire (Appendix B) which was provided for each teacher. The purpose of the questionnaire was to gather the perceptions of individual teachers relative to the mathematics performances of Zone One students.

Teachers were requested to provide the following personal information in the first three questions in the questionnaire. (1) The grade they teach (they were to choose only one grade and use it for subsequent questions); (2) the number of years taught in Zone One, and; (3) the total years of teaching experience.



Part I of the questionnaire listed eight possible factors that could influence the opportunities that students have to achieve the elementary mathematics objectives. Teachers were to rank these factors as the most likely to the least likely to contribute to a lack of student success.

Part II was also a ranking question although here the teachers were asked to rank seven possible contributing factors in any successful mathematics program in general.

Part III of the questionnaire was based on the actual performances of students in the Zone. The lowest composite achievement scores of Zone One students in each strand, grades one to six, were listed and teachers were asked to choose one of six possible explanations as the best reason for the lowest scores.

### Data Analysis

The following techniques were used for the analysis of the hypotheses.

#### Hypothesis One

A computer program that collects test item scores and matches them to the specific mathematics objectives they were validated to measure has been devised by the Division of Educational Research Services at the University of Alberta.

This program has been designed to report student achievement on objectives in percentage terms by strand and grade level. Individual student percentage scores will also be grouped to form composite percentage averages by school,



school system, total zone or out of zone categories. This analysis will be performed for the 1978 and 1979 data collected. A typical individual student profile used to report the 1978 results is shown in Table 4.

TABLE 4  
A TYPICAL STUDENT PROFILE

I County of G.P.# 1 Beaverlodge Elementary  
Student ID 10724 Grade Four (Tac to Analysis Form) June/78

Number	Operations & Properties	Measurement	Geometry	Graphing
1 25.0%	1 50.0%	1 60.0%	1 100.0%	1 100.0%
2 30.0%	2 37.5%	2 20.0%	2 100.0%	2 100.0%
3 100.0%	3 77.8%	3 33.3%	3 42.9%	3 100.0%
4 100.0%	4 40.0%	4 100.0%		4 75.0%
5 100.0%	5 60.0%	5 50.0%		
6 100.0%	6 38.9%	6 0.0%		
7 0.0%	7 25.0%	7 100.0%		
8 0.0%	8 50.0%	8 50.0%		
9 100.0%	9 22.2%	9 25.0		
	10 100.0%			
AVG 61.7%	50.1%	48.7%	81.0%	93.8%

The statistical data for each of hypothesis one through six relating to the 173 objectives of the elementary mathematics program will be displayed as in Figure 4. Every objective will feature the test items which were referenced to it. Section I of the analysis in Figure 4 relates directly to hypothesis one and two which records the percentage of students achieving in each of the four criterion levels for both 1978 and 1979. A proportions test was used to determine whether or not student achievement within the two years was significantly different; Section II provides the statistical tables for hypothesis three through six.



# LEVEL A (Grade 1)

## NUMBER

**OBJECTIVE 3** Associates a numeral with equivalent sets. (0-9) Cardinality.

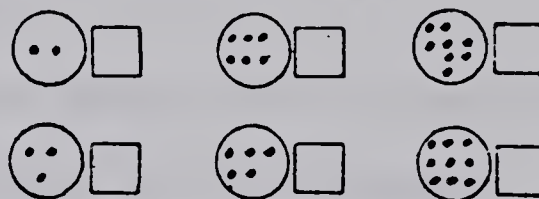
### TEST ITEMS

10. Circle the number that tells how many apples there are.



2      4      3

13. Count how many dots there are in each circle and print the number in the box by each circle.



11. Write in the box the number that tells how many tomatoes there are.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:1 STRAND:1 OBJECTIVE: 3  
 TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	0.66	0.92	0.42	0.98	2.07	3.09	96.85	95.02
MEAN (%)	13.57	15.29	60.00	58.33	79.09	78.77	99.48	99.50

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
H0: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: -0.937	3970	0.349	22.78	9744.96	1	29	0.069	0.796	
B: -2.111	3970	0.035	16.67	250.00	1	25	1.667	0.209	
C: -2.033	3970	0.042	2.53	977.67	1	99	0.256	0.614	
D: 2.938	3970	0.004	0.49	18592.01	1	3811	0.101	0.751	

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
YEARS	1978	1979							
EARLY	98.43	97.63	395.72	205713.95	1	2478	4.767	0.029	
LATE	98.16	97.85	31.55	101856.00	1	1300	0.403	0.526	
MALE	98.23	97.40	361.76	179970.42	1	2074	4.169	0.041	
FEMALE	98.41	98.00	81.98	151628.09	1	1894	1.024	0.312	
NORTH	98.34	99.00	117.96	57173.77	1	1074	2.216	0.137	
SOUTH	98.31	97.22	871.11	273473.50	1	2894	9.218	0.003	

FIGURE 4

OBJECTIVES, TEST ITEMS AND ANALYSIS



## Hypothesis Two

A one-way analysis of variance will be the statistical procedure used to test for significant differences between the 1978 and 1979 composite performance of Zone One students in each of the five strands, grades one to six.

## Hypothesis Three, Four, Five, and Six

The one-way analysis of variance design will be used to test for significant differences between the mathematics performance of early versus late starters, boys versus girls, North versus South Zone, and the Public versus Separate School Systems.

## Analysis of the Questionnaire

Different types of statistical analysis will be used for examining the information from the teacher questionnaire. Part I and Part II of the questionnaire, as ranking items, will require a rank test for independent samples. The Pearson product moment correlation coefficient will be used for the statistical analysis of the ranking section of parts I and II of the questionnaire. The intent here is to see if years of teaching can be used as a predictor for teachers choosing particular factors that could influence achievement.

A series of Eta Squared tests will be used for the analysis of part III which was not a ranking item. Still the test will determine whether or not teaching experience can be utilized to predict the likelihood of teachers picking specific reasons for low achievement ratings.



### The Analysis of the Objectives

Figure 4 illustrates how the analysis of each of the elementary mathematics objectives grades one to six will be displayed.

Each grade will be allocated a chapter beginning with Chapter IV for grade one through to Chapter IX for grade six.

A summary discussion related to student achievement within strands will be given at the conclusion of each chapter.

Chapter IX will report the results of the investigation in terms of the six hypotheses and in addition the findings from the questionnaire. A summary to include the implications and recommendations from the findings will be given in Chapter Eleven.

### **C. THE EFFECTIVENESS OF THE PRINT-OUTS**

Question five in the statement of the problem section of Chapter One does not have a corresponding hypothesis to be tested. The question will, however, be handled in a descriptive way.

Since print-outs are provided for individual students, schools and school systems levels it seems appropriate to ask relevant questions in each of these categories. To do this a total of 15 teachers and 10 administrators will be randomly chosen from throughout the zone to answer specific questions concerning the effectiveness of the computerized



forms.

The discussion of this question will necessarily look at utilization for the two separate years. The 1978 computer profiles of individual students contained only the student I.D. number and had to be matched with the student's corresponding Student Analysis for it to be of any use. These forms did not become available for teacher use until October of 1978, well into the school term. The 1979 optical scanned form was available in mid July and also contains the student's name. The questions relating to the 1979 profiles will deal with the teachers' and supervisors' anticipated use of the print-outs. This information will be collected during two separate visits to the zone and by telephone.



## CHAPTER IV

### GRADE ONE

#### ANALYSIS OF HYPOTHESIS ONE AND TWO FOR GRADE ONE

##### Notes on the Analysis

Figures 6 to 174, used in the analysis of hypothesis one and two, contain the mathematics program objectives (1978), the test items referenced to the objectives and the corresponding analysis of student achievement for grades one to six.

A discussion of the findings will be based on the analysis of the objectives although not all objectives will be discussed.

Part one of each analysis section contains two sets of numbers: line one gives the proportion (Number (%)) of pupils within each of four criterion categories A-D for both 1978 and 1979. These categories represent the achievement levels of below 50 percent, 50-64 percent, 65-84 percent, and 85-100 percent. Line two gives the mean percentage (mean (%)) for all pupils within each of the categories. The tables following these two lines contain the statistical data for comparing the proportions and the means for 1978 and 1979. The probabilities for the proportion test are displayed on the left while the F-test probabilities that compare the means for the two years are on the right.



The analysis section of the figures also includes a comparison of mean scores for the four pairs of Zone One subgroups. The probabilities associated with the F-tests in these tables compare only the same subgroup means for 1978 and 1979. Although the same subgroups are compared, for example, Early Starters for 1978 and 1979, the statistical program used in Chapter X will test difference between the Subgroup variables (eg. Early vs. Late Starters).

For the purposes of this study only those probabilities that are less than 0.02 level will be considered as statistically significant. This probability level represents what is considered to be educationally defensible mean and proportional differences. A detailed breakdown of the mark weighting allotted to each of the test items in the strands are included as the commencing figures for grades one to six (Chapters IV to IX). Figure 5 shows the grade one mark distribution.

Number (Five objectives tested, Figures 6 to 10)

Note: Objective five of the grade one Number strand in the Alberta program is the only objective not to be formally tested.

In regards to Hypothesis One, wherever eighty percent of the Zone One pupils reached the 85-100 percent category they did so for both 1978 and 1979. This was the case within



each strand, grades one to six.

### Hypothesis 1

Two objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were within the 85-100 percent category.

### Hypothesis 2

One objective had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

Pupils' understanding of equivalent and non-equivalent sets was high. Eighty-seven percent of the pupils performed at the 100 percent level on the items measuring this objective.

Pupils also handle the 'more, fewer, greater than, less than and equal to' relationships with little difficulty. Seventy-four percent of the pupils in 1978 and 1979 received scores of 100 percent with an additional twenty percent achieving means of 66 percent.

Over ninety-five percent of grade one pupils could associate a numeral (0-9) with equivalent sets (cardinality) at the 85-100 percent level.

Pupils also had little difficulty with the order property of numbers. Seventy-eight percent of those tested in 1979 had achievement scores in the 85-100 percent



PART II

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE (same as percent)
II	1	Measurement	3	1
II	2	Measurement	4	1
II	3	Measurement	1	1 $\frac{1}{2}$ ea.
II	4	Measurement	1	1 $\frac{1}{2}$ ea.
II	5	Measurement	3	1
II	6	Measurement	5	1
II	7	Measurement	5	1
II	8	Measurement	5	1
II	9	Measurement	5	1
II	10	Measurement	5	1
II	11	Measurement	3	1
II	12	Measurement	6	1
II	13	Measurement	6	2
II	14	Geometry	1	must be all correct 4
II	15	Geometry	2	1
II	16	Geometry	2	1
II	17	Geometry	2	1
II	18	Geometry	2	1
II	19	Graphing	1	2 (1 each row)
II	20	Graphing	1	3
II	21	Measurement	4	1
II	22	Measurement	4	1
II	23	Measurement	2	1

PART I

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE (same as percent)
I	1	Operations & Properties	1	2
I	2	Operations & Properties	1	2
I	3	Operations & Properties	2	3
I	4	Number	4	6
I	5	Number	1	3
I	6	Number	1	3
I	7	Number	2	2
I	8	Number	2	2
I	9	Number	2	2
I	10	Number	3	2
I	11	Number	3	2
I	12	Number	4	2
I	13	Number	3	6
I	14	Number	6	6
I	15	Operations & Properties	2	4
I	16	Number	6	4
I	17	Operations & Properties	2	3 $\frac{1}{2}$ ea.
I	18	Operations & Properties	3	6
I	19	Operations & Properties	3	10

FIGURE 5  
GRADE ONE DETAILED ANALYSIS OF MARK WEIGHTINGS







## LEVEL A (Grade 1)

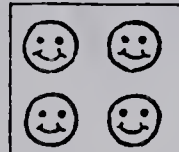
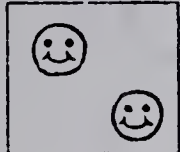
## NUMBER

## OBJECTIVE 2

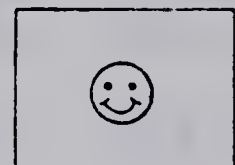
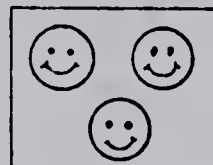
Describes relationships such as more, fewer, greater than, less than, equal to. (no symbols)

## TEST ITEMS

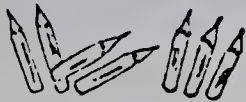
7. Look at the group of happy faces. Put an X on the box with fewer/less happy faces.



9. Look at the groups of happy faces. Put an X on the box with more happy faces.



3. Look at the sets of pencils and erasers.



There are less erasers than pencils. ☐

There are more erasers than pencils. ☐

Put an X in the box beside the sentence that is correct.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATAGORY A-D

CRITERION CATEGORIES FOR	GRADE:1	STRAND:1	OBJECTIVE: 2
--------------------------	---------	----------	--------------

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	4.56	5.04	0.09	0.16	21.12	20.80	74.22	74.00
MEAN (%)	29.55	24.73	50.00	50.00	66.78	66.84	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
HQ:	PROPOR78=PPROPOR79	#		SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	-0.700	3970	0.484 #	1104.00	30621.14	1	188	6.778	0.010	
B:	-0.607	3970	0.544 #	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>						
C:	0.245	3970	0.806 #	0.80	1927.30	1	831	0.346	0.557	
D:	0.162	3970	0.871 #	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>						

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE						
	1978	1979		#	SS		DF		F-RATIO	PROB
					BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	89.84	89.80	#	1.06	922639.51	1	2478	0.003	0.957	
LATE	89.46	87.96	#	734.08	526563.45	1	1300	1.812	0.178	
MALE	89.57	88.07	#	1166.74	848369.09	1	2074	2.852	0.092	
FEMALE	89.89	90.52	#	189.01	681182.16	1	1894	0.526	0.469	
NORTH	90.45	91.93	#	581.32	341584.11	1	1074	1.828	0.177	
SOUTH	89.44	88.28	#	974.47	1185630.42	1	2894	2.379	0.123	
PUBLIC	89.71	89.41	#	73.97	1188666.91	1	3164	0.197	0.657	
SEPARATE	89.77	88.58	#	283.62	343503.60	1	804	0.664	0.415	

FIGURE 7



# LEVEL A (Grade 1)

## NUMBER

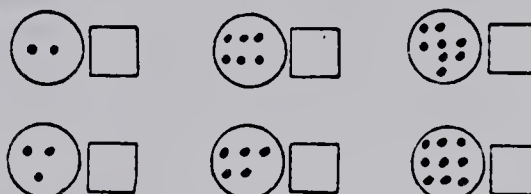
**OBJECTIVE 3** *Associates a numeral with equivalent sets. (0-9) Cardinality.*

### TEST ITEMS

10. Circle the number that tells how many apples there are.



13. Count how many dots there are in each circle and print the number in the box by each circle.



11. Write in the box the number that tells how many tomatoes there are.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:1 STRAND:1 OBJECTIVE: 3  
 TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	0.66	0.92	0.42	0.98	2.07	3.09	96.85	95.02
MEAN (%)	13.57	15.29	60.00	58.33	79.09	78.77	99.48	99.50

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: -0.937	3970	0.349 #	22.78	9744.96	1	29	0.065	0.796	
B: -2.111	3970	0.035 #	16.67	250.00	1	25	1.667	0.209	
C: -2.033	3970	0.042 #	2.53	977.67	1	99	0.256	0.614	
D: 2.938	3970	0.004 #	0.49	18592.01	1	3811	0.101	0.751	

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	98.43	97.63	#	395.72	205713.95	1	2478	4.767	0.029
LATE	98.16	97.85	#	31.55	101856.00	1	1300	0.403	0.526
MALE	98.23	97.40	#	361.76	179970.42	1	2074	4.169	0.041
FEMALE	98.41	98.00	#	81.98	151628.09	1	1894	1.024	0.312
NORTH	98.34	99.00	#	117.96	57173.77	1	1074	2.216	0.137
SOUTH	98.31	97.22	#	871.11	273473.50	1	2894	9.218	0.003
PUBLIC	98.54	97.72	#	529.90	230108.04	1	3164	7.286	0.007
SEPARATE	97.40	97.54	#	3.68	101233.05	1	804	0.029	0.864

FIGURE 8







# LEVEL A (Grade 1)

## NUMBER

### OBJECTIVE 6

Identifies and renames the number of 10's and the number of 1's in any 2 digit number.

## TEST ITEMS

14. How many tens and ones in each number. Write your answer in the blanks.

63 means \_\_\_\_\_ tens and \_\_\_\_\_ ones

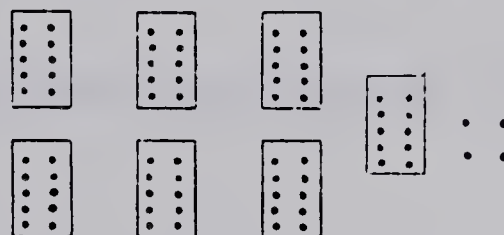
46 means \_\_\_\_\_ tens and \_\_\_\_\_ ones

70 means \_\_\_\_\_ tens and \_\_\_\_\_ ones

16. (A) How many tens? \_\_\_\_\_ How many ones? \_\_\_\_\_



(B) How many tens? \_\_\_\_\_ How many ones? \_\_\_\_\_



## ANALYSIS

### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:1 STRAND:1 OBJECTIVE: 5

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	30.06	25.41	5.93	6.12	8.80	9.32	55.22	59.15
MEAN (%)	24.87	25.59	58.73	57.88	78.29	78.95	99.28	99.51

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PROPOR78=PROPOR79				SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	3.259	3970	0.001	#	139.97	303327.45	1	1106	0.510	0.475
B:	-0.257	3970	0.797	#	43.45	3287.09	1	237	3.133	0.078
C:	-0.572	3970	0.568	#	39.59	4264.03	1	357	3.314	0.070
D:	-2.498	3970	0.013	#	29.97	12841.74	1	2264	5.284	0.022

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
			SS		DF				
GROUPS	YEARS	#	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	73.30	77.36	#	10155.22	2696766.72	1	2478	9.331	0.002
LATE	71.57	74.55	#	2878.06	1543114.26	1	1300	2.425	0.120
MALE	71.80	75.36	#	6541.98	2405886.92	1	2074	5.640	0.018
FEMALE	73.60	77.28	#	6366.49	2070868.11	1	1894	5.823	0.016
NORTH	76.94	75.84	#	321.36	1164516.93	1	1074	0.296	0.586
SOUTH	71.01	76.42	#	21133.79	3300432.93	1	2894	18.531	0.000
PUBLIC	72.52	76.28	#	11116.66	3558029.14	1	3164	9.886	0.002
SEPARATE	73.28	76.22	#	1742.68	921941.68	1	804	1.520	0.218

FIGURE 10



category.

Pupils had some problems with identifying and renaming the number of 10's and 1's in any 2 digit number (place value). Here only about sixty percent of the 1979 group reached category D and significantly fewer did in 1978. About one-quarter of the grade one's achieved within category A (below 50 percent) in 1979, about five percent fewer than did so in 1978.

Operations and Properties (Three objectives; figures 11 to 13).

#### Hypothesis 1

One objective had achievement proportions in 1978 and 1979 where eighty percent of the Zone One pupils were in the 85-100 percent category.

#### Hypothesis 2

One objective had a significant increase in the proportion of pupils achieving in the 85-100 percent category from 1978 to 1979.

#### Findings

Zone One pupils have a good understanding of the process of addition and subtraction in concrete situations. Close to ninety percent of these pupils were in category D (85-100 percent). They did have difficulty with the symbolizing aspect of addition and subtraction situations however. Some fifteen percent scored below the 50 percent







# OPERATIONS AND PROPERTIES

## LEVEL A (Grade 1)

**OBJECTIVE 2** *Symbolizes addition and subtraction situations.*

### TEST ITEMS



$$5 \square 2 = 3$$

17.  $4 \square 1 = 5$

$3 \square 2 = 1$

$6 \square 3 = 3$

15.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:1 STRAND:2 OBJECTIVE: 2  
 TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.93	14.30	25.31	22.70	4.94	6.01	52.82	56.99
MEAN (%)	20.78	21.59	57.16	56.56	75.24	75.59	98.89	98.35

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: 2.274	3970	0.023	100.70	131914.04	1	622	0.475	0.491	
B: 1.917	3970	0.055	82.80	20399.96	1	955	3.876	0.049	
C: -1.489	3970	0.137	6.52	5355.98	1	214	0.260	0.610	
D: -2.631	3970	0.009	158.92	25630.69	1	2173	13.473	0.000	

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS			SS		DF				
=====	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
EARLY	74.23	77.22	5512.16	2143156.22	1	2478	6.373	0.012	
LATE	72.79	75.41	2226.88	1213984.87	1	1300	2.385	0.123	
MALE	71.90	74.51	3505.01	1961868.40	1	2074	3.705	0.054	
FEMALE	76.13	78.75	3252.73	1536396.59	1	1894	4.010	0.045	
NORTH	78.03	76.32	780.89	908786.02	1	1074	0.923	0.337	
SOUTH	72.34	76.59	13020.42	2593319.87	1	2894	14.530	0.000	
PUBLIC	73.27	76.23	6854.08	2863456.12	1	3164	7.573	0.006	
SEPARATE	76.67	77.59	168.28	648153.81	1	804	0.209	0.648	

FIGURE 12



# OPERATIONS AND PROPERTIES

## LEVEL A (Grade 1)

### OBJECTIVE 3

*Demonstrates mastery of the basic facts involving sums and minuends through 9.*

### TEST ITEMS

18. Write the answers for each problem in the boxes.

$4 + 5 = \square$

$5 + 4 = \square$

$6 - 5 = \square$

$7 - 3 = \square$

$7 - 0 = \square$

$6 + 1 = \square$

19. Write the answers for each problem in the boxes.

8 + 0 <input type="text"/>	8 - 3 <input type="text"/>	7 - 5 <input type="text"/>	3 + 2 <input type="text"/>	4 + 4 <input type="text"/>
3 + 6 <input type="text"/>	5 - 2 <input type="text"/>	8 + 1 <input type="text"/>	6 - 2 <input type="text"/>	7 + 1 <input type="text"/>

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:1 STRAND:2 OBJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	5.41	5.85	5.17	6.34	12.79	12.78	76.62	75.03
MEAN (%)	20.33	21.59	57.95	57.80	77.11	76.32	96.23	96.56

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PROPOR78=PROPOR79			SS		DF		F-RATIO	PROB
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN		
A: -0.603	3970	0.547 #	88.36	60799.04	1	221	0.321	0.571
B: -1.576	3970	0.115 #	1.37	5219.93	1	225	0.059	0.808
C: 0.009	3970	0.993 #	78.83	12901.92	1	506	3.091	0.079
D: 1.172	3970	0.241 #	80.70	64159.46	1	3012	3.789	0.052

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
GROUPS			SS		DF		F-RATIO	PROB
=====	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	87.87	87.87 #	0.00	951817.27	1	2478	0.000	0.999
LATE	87.46	85.80 #	897.10	584291.79	1	1300	1.996	0.158
MALE	86.59	85.60 #	501.92	884726.13	1	2074	1.177	0.278
FEMALE	88.89	88.82 #	2.40	734335.00	1	1894	0.006	0.937
NORTH	87.80	88.42 #	101.56	441097.90	1	1074	0.247	0.619
SOUTH	87.66	86.67 #	698.55	1184455.32	1	2894	1.707	0.192
PUBLIC	87.42	86.90 #	213.98	1356735.79	1	3164	0.499	0.480
SEPARATE	88.83	87.96 #	154.17	268908.96	1	804	0.461	0.497

FIGURE 13



level and only fifty-seven percent of the pupils in 1979 achieved to the 85-100 percent level. Three quarters of the grade one pupils had mastered the basic facts involving sums and minuends through 9. Mean scores for all student sub-groups on the basic facts were in the high 80 percent range.

### Measurement (Six Objectives: Figures 14 to 19)

#### Hypothesis 1

Two objectives had achievement performances where eighty percent of the Zone One pupils were in the 85-100 percent range in both 1978 and 1979. As noted earlier wherever such proportions existed they did so for both years.

#### Hypothesis 2

None of the measurement objectives had significant increases in the proportions of pupils in category D for 1979 over 1978.

### Findings

Over eighty-five percent of the zone one pupils could tell time to the nearest hour with 100 percent accuracy. Fewer were able to read the days of the week in order however. About thirty percent of these individuals had zero performance on the days of the week item. No significant gains were recorded for 1979.

Grade one students do well with non-standard measurement. They handled gross comparisons such as longer

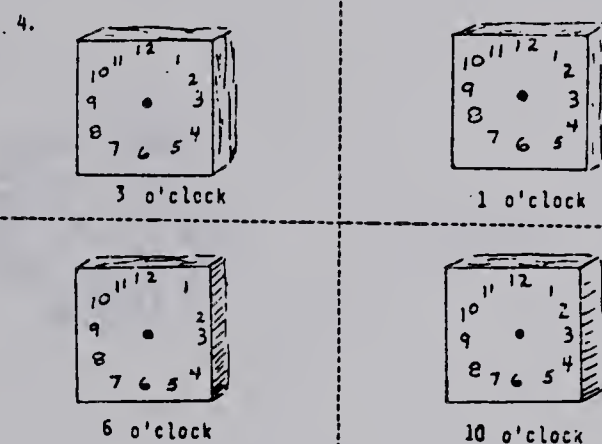
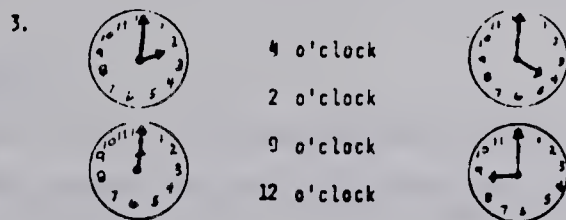


### LEVEL A (Grade 1)

## MEASUREMENT

**OBJECTIVE 1** Tells the time to hour.

## TEST ITEMS



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE: 1 STRAND: 3 OBJECTIVE: 1

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	4.14	4.66	9.97	9.26	0.0	0.0	85.89	86.08
MEAN (%)	0.0	0.0	50.00	50.00	*****	*****	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	<u>PROPORTION TEST</u>			#	<u>F-TEST</u>					
	HO: PROPOR78=PROPOR79			#	<u>SS</u>		<u>DF</u>			
	<u>T-CALC</u>	<u>DF</u>	<u>PROB</u>	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	-0.798	3970	0.425	#	<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>					
B:	0.754	3970	0.451	#	<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>					
C:	0.0	3970	1.000	#	<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>					
D:	-0.171	3970	0.864	#	<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE						
	1978	1979		#	SS		DF		F-RATIO	PROB
					BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	91.01	91.40	#	91.90	1419899.02	1	2478	0.160	0.689	
LATE	90.88	90.25	#	126.14	777118.48	1	1300	0.211	0.646	
MALE	90.58	90.12	#	107.60	1287214.17	1	2074	0.173	0.677	
FEMALE	91.19	91.36	#	13.27	1073023.39	1	1894	0.023	0.878	
NORTH	91.93	91.27	#	117.48	539603.71	1	1074	0.234	0.629	
SOUTH	90.46	90.51	#	1.74	1820411.76	1	2894	0.003	0.958	
PUBLIC	91.45	90.98	#	177.20	1804093.97	1	3164	0.311	0.577	
SEPARATE	88.47	89.72	#	314.66	553605.94	1	804	0.457	0.499	

FIGURE 14



### LEVEL A (Grade 1)

## MEASUREMENT

**OBJECTIVE 2** *Recites the days of the week in order.*

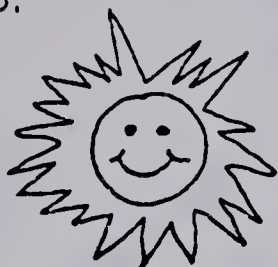
## TEST ITEMS

QUESTION 23

Say, "Name the days of the week starting with Sunday."

The student responds correctly if he orally names all the days of the week in the correct order. Mark his answer on the student's test sheet.

23.



Correct

/

Incorrect

## ANALYSIS

~~ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D~~  
 CRITERION CATEGORIES FOR GRADE:1 STRAND:3 OBJECTIVE: 2  
 TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	30.10	28.76	0.0	0.0	0.0	0.0	69.90	71.24
MEAN (%)	0.0	0.0	*****	*****	*****	*****	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
PROPORTION TEST				#	F-TEST					
HO: PROPOR78=PROPOR79				#	SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: 0.923	3970	0.356	#	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<&lt						

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	71.54	71.79	#	40.02	5037181.75	1	2478	0.020	0.888
LATE	68.32	72.10	#	4626.26	2727170.98	1	1300	2.205	0.138
MALE	66.21	67.90	#	1471.90	4588292.07	1	2074	0.665	0.415
FEMALE	73.87	74.94	#	537.40	3613703.11	1	1894	0.282	0.596
NORTH	71.43	76.51	#	6860.50	2078817.94	1	1074	3.544	0.060
SOUTH	69.30	69.38	#	4.19	6157122.88	1	2894	0.002	0.965
PUBLIC	70.89	73.97	#	7457.68	6333202.46	1	3164	3.726	0.054
SEPARATE	65.78	61.17	#	4278.65	1863314.40	1	804	1.846	0.175

FIGURE 15













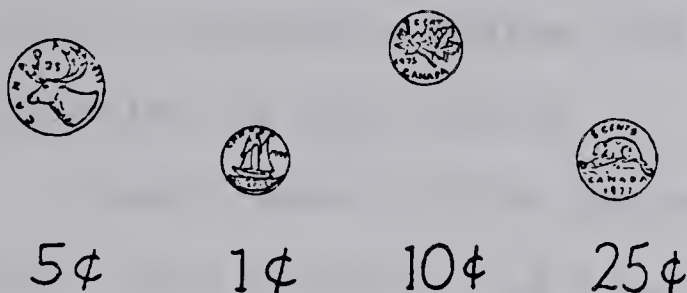


**LEVEL A (Grade 1)****MEASUREMENT**

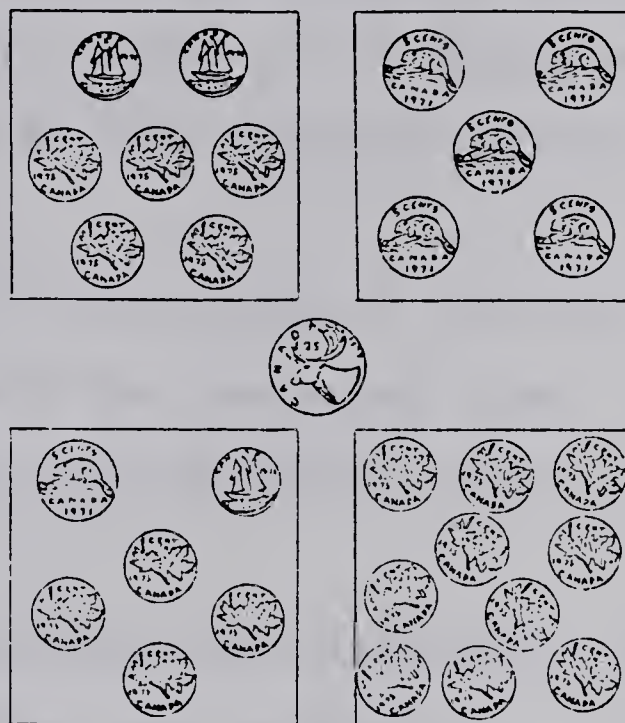
**OBJECTIVE 6** Recognizes pennies, nickles, dimes and quarters, and the value of each.

**TEST ITEMS**

12.



13.

**ANALYSIS****ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D**

CRITERION CATEGORIES FOR GRADE:1 STRAND:3 OBJECTIVE: 6

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	30.76	27.68	0.0	0.0	24.98	28.60	44.26	43.72
MEAN (%)	25.64	25.44	*****	*****	66.67	66.67	100.00	100.00

**TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS**

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79	#		SS	DF				
T-CALC	DF	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 2.127	3970	0.033 #	11.11	231649.36	1	1163	0.056	0.813
B: 0.0	3970	1.000 #	<<<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>>					
C: -2.578	3970	0.010 #	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>					
D: 0.345	3970	0.730 #	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>					

**COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS**

			F-TEST TABLE					
GROUPS	YEARS		#	SS	DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO PROB
EARLY	70.29	71.06	#	370.63	2498152.67	1	2478	0.368 0.544
LATE	64.97	68.12	#	3213.81	1387811.96	1	1300	3.010 0.083
MALE	70.77	71.30	#	141.58	2146107.09	1	2074	0.137 0.712
FEMALE	66.67	68.19	#	1096.42	1955743.71	1	1894	1.062 0.303
NORTH	73.05	71.52	#	627.16	1106634.30	1	1074	0.609 0.436
SOUTH	67.15	69.23	#	3137.39	2991785.49	1	2894	3.035 0.082
PUBLIC	68.81	70.55	#	2381.20	3280300.42	1	3164	2.297 0.130
SEPARATE	68.77	67.17	#	512.97	831408.73	1	804	0.496 0.481

FIGURE 19



than, shorter than, etc. to the degree that about ninety percent of them had achievement figures in the 85-100 percent category. They did somewhat poorer with estimating and measuring using non-standard units for capacity, mass and linear measures. Still ninety percent of the pupils were able to correctly answer two of the three items for this objective in both years.

About seventy-five percent of the pupils in 1978 and 1979 could identify the instruments for measuring time, mass, length, capacity and temperature to 85-100 percent level.

The grade one pupils do experience some difficulty with the value of pennies, nickles, dimes and quarters in collections up to twenty-five cents. Mean scores for the sub-groups ranged from 67 to 71 percent with forty-four percent of the pupils scoring 100 percent.

#### Geometry (two objectives; Figures 20 and 21)

##### Hypothesis 1

One objective had achievement performances where eighty percent of the Zone One pupils were in the 85-100 percent range for both 1978 and 1979.

##### Hypothesis 2

Neither objective had significant increases in the proportion of pupils achieving to the 85-100 percent criterion from 1978 to 1979.

#### Findings



### LEVEL A (Grade 1)

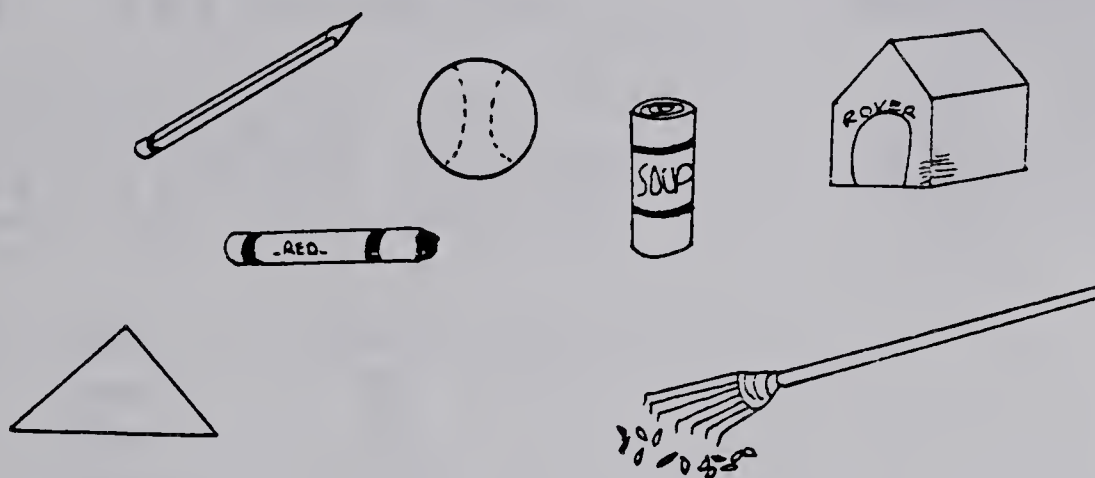
## GEOMETRY

## OBJECTIVE 1

Classifies, by manipulation,  
3-dimensional objects according to  
various attributes.

## TEST ITEMS

14. Which objects can roll? Mark these with an X.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:1 STRAND:4 OBJECTIVE:1

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	3.67	4.77	2.35	1.73	8.47	7.80	85.51	85.70
MEAN (%)	13.46	11.08	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST									
HO: PROPOR78=PROPOR79	#	F-TEST							
T-CALC	DF	PROB	#	SS		DF			
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	-1.725	3970	0.085	#	234.61	25687.83	1	164	1.498 0.223
B:	1.367	3970	0.172	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				
C:	0.765	3970	0.445	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				
D:	-0.167	3970	0.868	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EAFLY	93.73	93.08	#	258.80	948858.13	1	2478	0.676	0.411
LATE	92.86	92.56	#	27.95	526644.96	1	1300	0.069	0.793
MALE	93.95	92.90	#	572.68	785035.16	1	2074	1.513	0.219
FEMALE	93.08	92.99	#	3.43	746847.84	1	1894	0.009	0.926
NORTH	93.82	93.97	#	5.78	380442.06	1	1074	0.016	0.898
SOUTH	93.42	92.58	#	505.44	1151096.77	1	2894	1.271	0.260
PUBLIC	93.84	93.60	#	49.04	1135496.60	1	3164	0.137	0.712
SEPARATE	92.23	90.55	#	573.40	393053.31	1	804	1.173	0.279

FIGURE 20







The pupils experienced success with the classifying of 3-dimensional objectives according to shape attributes. Performances were such that over eighty-five percent of the grade ones in the zone reached category D (85-100 percent).

Over eighty-five percent of the pupils could also recognize and name the circle, square, triangle and rectangle in three of the four items related to such terminology but only about two-thirds achieved to the 85 percent level.

Graphing (One objective; figure 22)

#### Hypothesis 1

The one graphing objective did not have an eighty percent proportion of students achieving within category D (85-100 percent) for either 1978 or 1979.

#### Hypothesis 2

The proportions of pupils achieving to the 85-100 percent level on the one objective did not increase significantly in 1979 over the 1978 testing.

#### Findings

Over seventy percent of the pupils in 1978 and 1979 were able to construct graphs using pictures and objects to achievement levels C and D (65-100 percent). At the same time about twenty percent of the pupils could not construct a graph with any degree of accuracy.



## LEVEL A (Grade 1)

## GRAPHING

## OBJECTIVE 1

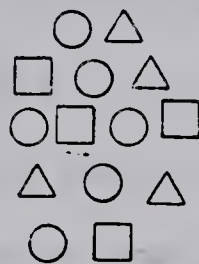
Collects data from immediate environment and constructs graphs using pictures or objects.

## TEST ITEMS

19. Some boys have 6 blue cars and 3 yellow cars.  
Show this on the graph by coloring the correct  
number of cars.



20. Make a graph showing the correct number of each shape. Draw the shapes.

[illegible]

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATAGORY A-D

CRITERION CATEGORIES FOR GRADE:1 STRAND:5 OBJECTIVE:1

TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	21.64	18.91	7.53	8.88	15.90	15.82	54.94	56.39
MEAN (%)	29.65	27.05	60.00	60.00	80.00	80.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST									
H0: PROPOR78=PROPOR79	#	F-TEST							
T-CALC	DE	PROB	#	SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
A:	2.132	3970	0.033	#	1345.05	229004.52	1	807	4.740 0.030
B:	-1.560	3970	0.119	#	0.00	0.00	1	322	7.667 0.006
C:	0.069	3970	0.945	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				
D:	-0.919	3970	0.358	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	79.19	80.31	#	777.86	2013413.10	1	2478	0.957	0.328
LATE	77.57	77.21	#	41.20	1210784.30	1	1300	0.044	0.833
MALE	76.78	77.94	#	703.99	1827605.06	1	2074	0.799	0.372
FEMALE	80.55	81.21	#	208.26	1542007.57	1	1894	0.256	0.613
NORTH	79.36	81.58	#	1309.32	867756.48	1	1074	1.621	0.203
SOUTH	78.29	78.75	#	156.62	2510999.18	1	2894	0.181	0.671
PUBLIC	78.30	78.51	#	36.68	2774212.21	1	3164	0.042	0.838
SEPARATE	79.81	83.10	#	2180.79	600606.80	1	804	2.919	0.088

FIGURE 22



## A. DISCUSSION OF THE GRADE ONE RESULTS

The achievement picture for grade one, given in Tables 5, 6 and 7 is good.

There are however indications that problems may be forthcoming within at least three of the strands. Discussion of these and subsequent factors will be handled within the context of the five strands of each grade level.

### Number

Although over ninety percent of the pupils reached categories C and D on the overall number strand achievement, the one-quarter group that fail on the place value objective is cause for some concern.

### Operations and Properties

The relatively high performance on the basic fact items is surprising when compared to the lower scores on symbolizing addition and subtraction situations (Figure 12). Although grade one pupils seem to understand the actions associated with addition and subtraction, they may require more discussion and activity to enable a better linking of the numerals with the operation symbols.

### Measurement

The performance on grade one measurement items was generally strong. Certainly the objectives appear to be within the ability range of children entering school.

Question 13 in Figure 14, one of the items used to determine the ability of pupils to recognize coins and their values, goes beyond the grade one objective. The lower



TABLE 5  
PERCENTAGE MEANS FOR GRADE ONE STUDENTS IN ZONE  
ONE FOR 1978 AND 1979

ZONE ONE		GRADE ONE				JUNE/78			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	92.9%	1	91.6%	1	90.9%	1	93.5%	1	78.6%
2	89.7%	2	73.9%	2	69.9%	2	87.5%		
3	98.3%	3	87.7%	3	95.6%				
4	89.3%			4	88.4%				
5	72.7%			5	92.5%				
				6	68.8%				
<hr/>									
AVG	88.6%		84.4%		84.3%		90.5%		78.6%

ZONE ONE		GRADE ONE				JUNE/79			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	92.0%	1	92.2%	1	90.7%	1	92.9%	1	79.5%
2	89.2%	2	76.5%	2	71.2%	2	87.3%		
3	97.7%	3	87.1%	3	95.1%				
4	89.1%			4	85.7%				
5	76.3%			5	91.7%				
				6	69.8%				
<hr/>									
AVG	88.9%		85.3%		84.0%		90.1%		79.5%

scores for this objective may be attributed to the forming combinations of coins requirement which is actually a level two requirement.

The fact that one-third of the pupils had difficulty with reciting the days of the week in order (recall) may be an indication that this skill is taken for granted by teachers.



TABLE 6

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:1 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	1.83	1.79	4.47	4.28	23.10	22.32	70.60	71.61
MEAN (%)	33.46	28.46	59.01	58.54	76.72	76.82	95.78	95.93

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79			SS		DF			
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 0.110	3970	0.912	446.46	23114.60	1	70	1.352	0.249
B: 0.290	3970	0.772	9.69	3038.49	1	172	0.548	0.460
C: 0.582	3970	0.560	2.41	27003.06	1	901	0.081	0.777
D: -0.702	3970	0.483	15.25	65670.29	1	2821	0.696	0.404

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:1 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=2126. 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	7.20	5.42	5.55	6.34	23.71	22.05	63.55	66.20
MEAN (%)	32.00	32.00	57.84	57.00	76.43	76.15	95.65	95.40

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79			SS		DF			
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 2.290	3970	0.022	0.00	46782.66	1	251	0.000	0.998
B: -1.049	3970	0.294	40.52	4038.95	1	233	2.337	0.126
C: 1.240	3970	0.215	17.72	29865.32	1	909	0.539	0.463
D: -1.744	3970	0.081	37.58	71243.41	1	2571	1.356	0.245

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:1 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=2126 1979 N=1846

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	3.20	4.23	7.38	7.84	31.84	29.79	57.57	58.94
MEAN (%)	35.17	26.23	58.85	59.16	76.26	76.26	94.80	95.08

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79			SS		DF			
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -1.715	3970	0.087	2903.12	46228.95	1	144	9.043	0.003
B: 0.416	3970	0.678	6.79	4216.00	1	285	0.459	0.499
C: 1.394	3970	0.164	0.00	40557.74	1	1225	0.000	0.994
D: -0.870	3970	0.384	46.22	53002.42	1	2310	2.015	0.156



TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HC: PRCPOR78=PRCPOR79 #									
				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.132	3970	0.033 #	1345.05	229004.52	1	807	4.740	0.030
B:	-1.560	3970	0.119 #	0.00	0.00	1	322	4.411	0.037
C:	0.069	3970	0.945 #	0.0	0.00	1	628	0.0	1.000
D:	-0.919	3970	0.358 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					



### Geometry

The high achievement mean scores on the two geometry objectives certainly indicates that they are within the range of at least ninety-five percent of the pupils at the grade one level. The knowledge being measured by the items however may be more of an indication of that which is acquired out of school than of the instructional treatment of geometry.

### Graphing

Since achievement was high on the prerequisite skills of matching and cardinality it seems that the format and structure of graphs is unfamiliar to grade one pupils.



## CHAPTER V

### GRADE TWO

#### ANALYSIS OF HYPOTHESIS ONE AND TWO FOR GRADE TWO

NOTE: For a description of the figures used in the following analysis see Chapter IV.

NUMBER (Seven objectives; Figure 24 to 50).

##### Hypothesis 1

Three objective had performances where eighty percent of the Zone One pupils in 1978 and 1979 were within the 85-100 percent catagory.

##### Hypothesis 2

Three objectives had significant increases in the proportion of pupils achieving to the 85-100 percent level in 1979.

##### Findings

The grade two pupils demonstrated an understanding of cardinal number (eg. associating a numeral with a set of objects). Over eighty percent of Zone One pupils combined to form a mean score of 99 percent. Even higher achievement levels were found for ordering numerals and recognizing "betweeness".

Some difficulties are beginning to emerge in the important place value concepts. While about three-quarters of the pupils could read and write numerals (0-999) to the



QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE	% VALUE
1	Number	7	4	1
2	Number	3	4	1
3	Number	4	12	3
4	Number	4	12	3
5	Number	3	4	1
6	Number	7	4	1
7	Number	5	4	1
8	Number	5	4	1
9	Number	5	4	1
10	Number	3	4	1
11	Number	3	4	1
12	Number	3	4	1
13	Number	3	4	1
14	Operations & Properties	4	9	8
15	Operations & Properties	4	10	
16	Operations & Properties	4	13	
17	Number	1	12	3
18	Number	2	20	5
19	Number	1	12	3
20	Number	7	8	2
21	Number	5	12	3
22	Number	6	28	7
23	Operations & Properties	2	4	1
24	Operations & Properties	1	4	1
25	Operations & Properties	1	4	1
26	Operations & Properties	2	8	2
27	Operations & Properties	3	4	1
28	Operations & Properties	3	4	1
29	Operations & Properties	3	4	1
30	Operations & Properties	5	8	2
31	Operations & Properties	5	8	2
32	Operations & Properties	5	8	2
33	Operations & Properties	6	32	8

- PART I -

FIGURE 23

## GRADE TWO DETAILED ANALYSIS OF MARK WEIGHTINGS

QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE	% VALUE
1	Measurement	5	1	$\frac{1}{4}$
2	Measurement	5	1	$\frac{1}{4}$
3	Measurement	5	1	$\frac{1}{4}$
4	Measurement	5	1	$\frac{1}{4}$
5	Measurement	5	1	$\frac{1}{4}$
6	Measurement	5	1	$\frac{1}{4}$
7	Measurement	5	1	$\frac{1}{4}$
8	Measurement	5	1	$\frac{1}{4}$
9	Measurement	1 & 2	2	$\frac{1}{2}$
10	Measurement	1 & 2	2	$\frac{1}{2}$
11	Measurement	3	4	1
12	Measurement	6	12	3
13	Measurement	7	2	$\frac{1}{2}$
14	Measurement	7	2	$\frac{1}{2}$
15	Measurement	10	2	$\frac{1}{2}$
16	Measurement	10	2	$\frac{1}{2}$
17	Measurement	8	2	$\frac{1}{2}$
18	Measurement	8	2	$\frac{1}{2}$
19	Measurement	9	4	1
20	Measurement	9	4	1
21	Measurement	9	4	1
22	Geometry	1 & 2	16	4
23	Geometry	3	4	1
24	Geometry	3	4	1
25	Geometry	3	4	1
26	Graphing	1	12	3
27	Graphing	2	20	5
28	Measurement	4	4	1
29	Measurement	5	2	$\frac{1}{2}$
30	Measurement	5	2	$\frac{1}{2}$
TOTALS:			120	30

- PART II -

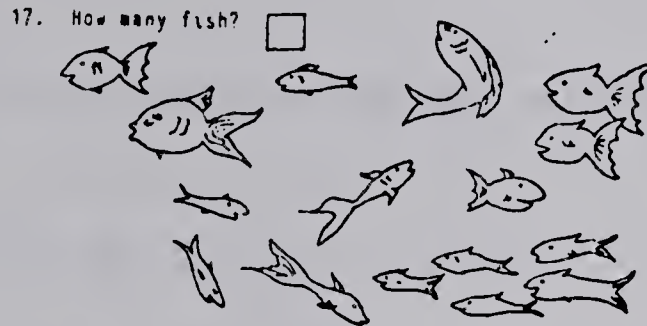


# LEVEL B (Grade 2)

## NUMBER

**OBJECTIVE 1** Identifies the cardinal number associated with a set of objects.

### TEST ITEMS



19. How many triangles? Write the number on this blank. \_\_\_\_\_



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 1  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	1.61	2.66	13.33	13.62	0.13	0.29	84.93	83.43
MEAN (x)	2.03	6.14	50.00	50.18	72.22	75.00	99.95	99.94

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPR78=PROFOR79			SS		DF				
I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: -2.417	4371	0.016 #	373.53	9669.31	1	90	3.477	0.066	
B: -0.283	4371	0.777 #	4.62	373.08	1	567	7.270	0.007	
C: -1.163	4371	0.245 #	15.43	462.96	1	7	0.233	0.644	
D: 1.361	4371	0.174 #	0.12	2280.69	1	3661	0.190	0.663	

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS	YEARS		SS		DF				
*****	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
EARLY	91.67	90.77 #	563.86	1253316.04	1	2788	1.254	0.263	
LATE	91.61	90.11 #	781.04	653010.23	1	1399	1.673	0.196	
MALE	90.29	89.25 #	600.17	1147949.78	1	2232	1.167	0.280	
FEMALE	93.15	91.99 #	713.34	827189.12	1	2137	1.843	0.175	
NORTH	91.25	90.78 #	84.89	728118.22	1	1518	0.177	0.674	
SOUTH	91.93	90.51 #	1444.72	1255320.96	1	2851	3.281	0.070	
PUBLIC	91.90	90.52 #	1727.81	1604614.39	1	3611	3.888	0.049	
SEPARATE	90.53	90.95 #	24.21	378493.33	1	758	0.048	0.826	

FIGURE 24



## LEVEL B (Grade 2)

### NUMBER

**OBJECTIVE 2** *Orders numerals and recognizes "betweenness." (0-100)*

### TEST ITEMS

18. Which number is missing? Write it in the blank.

12, 13, \_\_\_\_\_, 15

48, 49, 50, \_\_\_\_\_

\_\_\_\_\_, 65, 67, 68

29, \_\_\_\_\_, 31, 32

\_\_\_\_\_, 108, 109, 110

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 2  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	2.30	3.09	1.82	2.03	8.68	7.15	87.19	87.73
MEAN (%)	12.92	13.36	59.52	59.05	79.97	79.93	99.99	99.99

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PROPOR78=PROPOR79			SS		DF			
I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -1.617	4371	0.106 #	5.48	26474.43	1	115	0.024	0.878
B: -0.494	4371	0.622 #	4.76	552.38	1	62	0.707	0.403
C: 1.872	4371	0.061 #	0.15	74.20	1	346	0.719	0.397
D: -0.537	4371	0.592 #	0.00	324.68	1	3822	0.032	0.857

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE								
GROUPS	YEARS		#	SS		DF		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO PROB
EARLY	95.35	95.40	#	1.99	674310.34	1	2788	0.008 0.928
LATE	95.95	94.38	#	864.57	369033.40	1	1399	3.278 0.070
MALE	95.00	94.80	#	23.05	606883.14	1	2232	0.085 0.771
FEMALE	96.04	95.31	#	289.52	483936.45	1	2137	1.278 0.258
NORTH	93.43	93.57	#	7.68	562852.18	1	1518	0.021 0.886
SOUTH	96.71	95.77	#	633.19	520749.62	1	2851	3.467 0.063
PUBLIC	95.46	94.74	#	461.45	940661.18	1	3611	1.771 0.184
SEPARATE	95.77	96.45	#	87.41	149984.17	1	758	0.442 0.507

FIGURE 25



# LEVEL B (Grade 2)


## NUMBER

OBJECTIVE 3 Reads and writes numerals. (0-999)

### TEST ITEMS

Say, "In the next box, box number 10, write the number forty-nine on the blank--write the number forty-nine on the blank in box 10."

2.

	375	575	
	373	573	737

10.

2. Say, "In the next box, the one with the cat, find the numeral five hundred seventy three and draw a circle around it--draw a circle around five hundred seventy three."

11.

5.

937 793 739  
379 397

12.

- Say, "In box number 5, the first one at the top of the page, find the number seven hundred ninety three and draw a circle around it--draw a circle around seven hundred ninety three."

13.

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	1.48	3.09	3.60	3.24	21.10	19.81	73.82	73.86
MEAN (X)	26.47	22.01	50.15	50.25	78.52	77.83	99.98	99.94

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST			
HO: PRCPOR78=PRCPOR79				SS	DF		
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN
						F-RATIO	PROB
A:	-3.604	4371	0.000	442.74	12026.08	1	96
B:	0.666	4371	0.505	0.36	219.67	1	148
C:	1.060	4371	0.289	105.84	52632.25	1	854
D:	-0.036	4371	0.971	1.14	1157.53	1	3227

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE			
				SS	DF		
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN
	1978	1979				F-RATIO	PROB
EARLY	91.90	91.48	#	122.58	762928.77	1	2788
LATE	93.98	91.80	#	1661.99	349894.96	1	1399
MALE	92.21	91.94	#	41.02	593277.34	1	2232
FEMALE	92.95	91.14	#	1752.92	568125.30	1	2137
NORTH	89.32	87.56	#	1164.45	644269.40	1	1518
SOUTH	94.44	93.49	#	654.01	487692.77	1	2851
PUBLIC	92.53	91.03	#	2115.46	1020757.20	1	3611
SEPARATE	92.74	94.02	#	310.32	138501.36	1	758

FIGURE 26



## LEVEL B (Grade 2)

### NUMBER

**OBJECTIVE 4**    *Names ordinals first to tenth.*

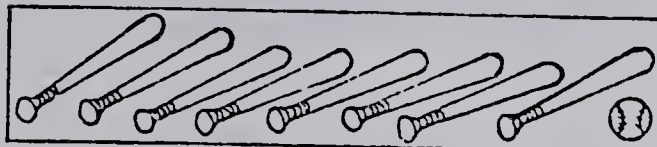
### TEST ITEMS

3.



Say, "In the next box, the one with the boy in it, draw a circle around the eighth star from the boy--draw a circle around the eighth star from the boy."

4.



Say, "In the last box, the one with the ball and the bats, draw a circle around the fifth bat from the ball--draw a circle around the fifth bat from the ball."

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR    GRADE:2    STRAND:1    OBJECTIVE: 4

TOTAL NUMBER OF PUPILS:    1978 N=2303    1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	6.47	11.06	14.55	12.90	0.09	0.29	78.90	75.75
MEAN (X)	2.46	13.85	50.01	50.06	66.67	69.44	100.00	99.98

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
I-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -5.397	4371	0.000	#	11701.47	59828.37	1	376	73.540	0.000
B: 1.579	4371	0.115	#	0.37	155.16	1	600	1.435	0.231
C: -1.569	4371	0.117	#	11.57	231.48	1	6	0.300	0.604
D: 2.486	4371	0.013	#	0.31	363.65	1	3383	2.926	0.087

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	84.96	82.91	#	2910.48	2556166.39	1	2788	3.174	0.075
LATE	89.37	85.29	#	5808.89	1038328.51	1	1399	7.827	0.005
MALE	85.19	83.20	#	2192.00	2048878.23	1	2232	2.388	0.122
FEMALE	87.64	84.67	#	4732.23	1673136.87	1	2137	6.044	0.014
NORTH	79.86	76.54	#	3210.26	1822419.66	1	1518	2.674	0.102
SOUTH	90.15	87.32	#	5681.58	1798455.75	1	2851	5.007	0.003
PUBLIC	85.73	82.49	#	9471.35	3294305.62	1	3611	10.382	0.001
SEPARATE	89.60	90.46	#	137.92	408083.94	1	758	0.256	0.613

FIGURE 27



## LEVEL B (Grade 2)

### NUMBER

#### OBJECTIVE 5

*Identifies the number of 100's, 10's and 1's in a given three-digit numeral.*

### TEST ITEMS

7.

Say, "Look at this flashcard (798). In box number 7 in the next row, write the number that shows how many hundreds there are in this number--write the number that shows how many hundreds. Write it on the blank."

8.

Say, "Look at this flashcard (401). In the next box, box number 8, write the number that shows how many ones there are in the number on the card. Write it on the blank--write the number that shows how many ones."

9.

Say, "Look at this flashcard (267). In the first box in the next row, number 9, write the number that shows how many tens there are in the number on the card. Write it on the blank--write the number that shows how many tens."

21. Fill in the blanks.

539      \_\_\_\_\_ tens      \_\_\_\_\_ ones      \_\_\_\_\_ hundreds

462      \_\_\_\_\_ ones      \_\_\_\_\_ tens      \_\_\_\_\_ hundreds

596      \_\_\_\_\_ hundreds      \_\_\_\_\_ ones      \_\_\_\_\_ tens

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 5

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	28.53	26.81	14.59	13.33	17.24	16.57	39.64	43.29
MEAN (X)	17.62	19.48	50.04	50.68	76.36	76.57	99.96	99.93

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	1.266	4371	0.206	#	1045.34	198704.43	1	1210	6.366 0.012
B:	1.196	4371	0.232	#	62.48	2163.82	1	610	17.615 0.000
C:	0.589	4371	0.556	#	7.56	49165.19	1	738	0.113 0.736
D:	-2.441	4371	0.015	#	0.50	948.36	1	1807	0.957 0.328

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	63.68	67.32	#	9165.19	3441855.75	1	2768	7.424	0.007
LATE	67.66	69.67	#	1417.15	1642628.35	1	1399	1.207	0.272
MALE	65.99	68.29	#	2943.01	2635535.02	1	2232	2.492	0.115
FEMALE	64.20	67.54	#	5939.03	2658246.09	1	2137	4.774	0.029
NORTH	60.08	64.23	#	6473.59	2026586.53	1	1518	4.849	0.028
SOUTH	68.02	69.72	#	2049.54	3221831.66	1	2851	1.814	0.179
PUBLIC	65.31	67.83	#	5679.37	4458500.93	1	3611	4.616	0.032
SEPARATE	64.15	68.34	#	3321.13	836913.13	1	758	3.008	0.083

FIGURE 28



## LEVEL B (Grade 2)

### NUMBER

**OBJECTIVE 6** *Identifies multiples by counting by 5's, 10's and 100's.*

### TEST ITEMS

22. Fill in the blanks.

Count by 5's

35, 40, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, 60, \_\_\_\_\_, 70, \_\_\_\_\_

Count by 10's

\_\_\_\_\_, 20, \_\_\_\_\_, \_\_\_\_\_, 50, \_\_\_\_\_, \_\_\_\_\_

Count by 100's

0, \_\_\_\_\_, 200, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, 600

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 6  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	6.34	5.65	4.69	3.53	3.08	2.42	85.89	88.41
MEAN (%)	15.61	16.82	62.70	61.35	74.25	74.50	99.07	99.24

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79			SS		DF			
I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A: 0.955	4371	0.340 #	95.51	65333.51	1	261	0.382	0.537
B: 1.928	4371	0.054 #	79.16	3384.59	1	179	4.187	0.042
C: 1.344	4371	0.180 #	1.90	1528.71	1	119	0.148	0.701
D: -2.478	4371	0.013 #	26.49	27134.16	1	3806	3.716	0.054

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE								
GROUPS			SS		DF			
YEARS	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
EARLY	90.77	92.71 #	2611.14	1305445.72	1	2788	5.577	0.018
LATE	92.41	92.69 #	28.95	602856.27	1	1399	0.067	0.796
MALE	90.51	92.90 #	3162.19	1054389.95	1	2232	6.694	0.010
NORTH	86.33	91.77 #	11121.50	972259.87	1	1518	17.364	0.000
SOUTH	94.18	93.08 #	873.26	996565.55	1	2851	2.498	0.114
PUBLIC	91.14	92.83 #	2552.94	1654781.67	1	3611	5.571	0.018
SEPARATE	92.14	91.83 #	18.17	347175.29	1	758	0.040	0.842

FIGURE 29



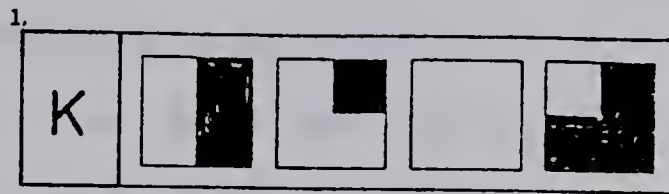
# LEVEL B (Grade 2)

## NUMBER

### OBJECTIVE 7

Identifies and represents fractions (halves and quarters) in a concrete setting.

### TEST ITEMS



Say, "In the box at the top of the page, the one with the letter K, put a circle around the square that is half black--repeat put a circle around the square that is half black."

6.

1    $\frac{1}{4}$     $\frac{1}{2}$     $\frac{4}{1}$

Say, "Watch me. Look at this sheet of cardboard." Hold up the cardboard sheet that has one quarter blackened.

Say, "In the next box, box number 6, draw a circle around the number that shows how much of this sheet is black--circle the number that shows how much is black."

20. Color in  $\frac{1}{2}$  of the circle.



Color in  $\frac{1}{4}$  of the rectangle.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:1 OBJECTIVE: 7  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	8.51	7.05	18.84	18.79	34.43	32.46	38.21	41.65
MEAN (%)	21.46	21.66	50.04	50.53	75.02	75.03	100.00	99.97

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	1.792	4371	0.073	3.36	30330.72	1	340	0.038	0.846
B:	0.045	4371	0.964	48.65	2311.71	1	821	17.279	0.000
C:	1.378	4371	0.169	0.05	272.72	1	1463	0.288	0.592
D:	-2.347	4371	0.019	0.37	311.78	1	1741	2.042	0.153

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	74.87	76.73	#	2382.57	1633773.92	1	2788	4.066	0.044
LATE	76.21	77.94	#	1043.58	846467.18	1	1399	1.725	0.189
MALE	74.42	76.65	#	2771.28	1377985.21	1	2232	4.489	0.034
FEMALE	76.22	77.49	#	847.97	1212588.11	1	2137	1.494	0.222
NORTH	75.88	75.42	#	76.68	1012435.24	1	1518	0.115	0.735
SOUTH	74.97	77.86	#	5952.94	1577241.02	1	2851	16.760	0.001
PUBLIC	75.14	76.23	#	1066.60	2200108.33	1	3611	1.751	0.186
SEPARATE	76.10	80.86	#	4317.90	385846.11	1	758	8.483	0.004

FIGURE 30



85-100 percent level only about forty percent could identify the number of 100's, 10's, or 1's in a given three-digit number at the same achievement level.

Over eighty-five percent of the pupils in 1978 and 1979 achieved in category D on the skill of identifying multiples by counting by 5's, 10's and 100's. The mean performances of all sub-groups were above 90 percent.

Grade two pupils had some difficulty identifying the common fractions of one-half and one-quarter (Figure 30). Still about three-quarters of the Zone One students could correctly answer three of the four fraction items in both 1978 and 1979.

#### OPERATIONS AND PROPERTIES (Six objectives; Figures 31 to 36)

##### Hypothesis 1

None of the objectives in this strand had achievement standings whereby eighty percent of the Zone One students were in category D (85-100 percent) in 1978 or 1979.

##### Hypothesis 2

Three objectives had significant increases from 1978 to 1979 in the proportion of students achieving in the 85-100 percent category.

##### Findings

Significantly (.000) more pupils in 1979 could symbolize addition and subtraction situations; still about twenty-two percent of the Zone One pupils had a zero score for this skill. Pupils could actually perform the addition











## OPERATIONS AND PROPERTIES

## LEVEL B (Grade 2)

**OBJECTIVE 3** Understands the processes of multiplication and division.

## TEST ITEMS

27. Complete:



3 sets of 3 apples               apples.

28. Draw 15 balls.  
Use all the balls to make 3 equal groups.

29. Complete:



6 boys

Make 3 equal groups of boys. \_\_\_\_\_ boys in each group.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND:2 OBJECTIVE:3  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	36.73	36.81	7.29	5.46	28.40	26.57	27.57	31.16
MEAN (%)	25.13	24.46	50.00	50.00	71.01	70.41	99.99	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PROPOR78=PROPOR79			#	SS		DF			
	I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	-0.053	4371	0.958	#	176.72	326850.65	1	1606	0.868	0.352
B:	2.472	4371	0.013	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	1.351	4371	0.177	#	108.50	61477.42	1	1202	2.121	0.146
D:	-2.603	4371	0.010	#	0.06	69.34	1	1278	1.016	0.314

### -----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	59.92	62.25	#	3879.52	2968890.92	1	2788	3.643	0.057
LATE	61.82	60.72	#	421.96	1435903.80	1	1399	0.410	0.522
MALE	59.94	61.23	#	928.56	2360219.26	1	2232	0.878	0.349
FEMALE	61.32	61.98	#	237.20	2225985.39	1	2137	0.228	0.633
NORTH	59.47	59.62	#	8.72	1741113.35	1	1518	0.008	0.931
SOUTH	61.27	62.57	#	1195.50	2840790.03	1	2851	1.200	0.274
PUBLIC	60.74	61.17	#	169.97	3842314.87	1	3611	0.159	0.690
SEPARATE	60.01	63.58	#	2415.95	736328.20	1	758	2.487	0.115

FIGURE 33



# OPERATIONS AND PROPERTIES

## LEVEL B (Grade 2)

### OBJECTIVE 4

*Demonstrates mastery of basic facts involving sums and minuends to 18.*

### TEST ITEMS

14. Find the sum.

$$\begin{array}{r} 6 \\ + 7 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ + 5 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ + 8 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ + 9 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ + 8 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ + 9 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ + 7 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ + 6 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ + 8 \\ \hline \end{array}$$

15. Subtract:

$$\begin{array}{r} 14 \\ - 8 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ - 6 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ - 9 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ - 9 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ - 7 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \\ - 6 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ - 10 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ - 8 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ - 7 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ - 9 \\ \hline \end{array}$$

16. Solve the following:

$$\begin{array}{ll} 16 - 8 = \underline{\quad} & 17 - 9 = \underline{\quad} \\ 4 + 6 = \underline{\quad} & 6 + 8 = \underline{\quad} \\ 13 + 4 = \underline{\quad} & 7 + 9 = \underline{\quad} \\ 15 - 7 = \underline{\quad} & 15 - 10 = \underline{\quad} \\ 12 + 6 = \underline{\quad} & 14 - 5 = \underline{\quad} \\ 11 - 3 = \underline{\quad} & 5 + 11 = \underline{\quad} \\ 3 + 14 = \underline{\quad} & \end{array}$$

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND:2 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	27.40	29.03	14.20	16.76	20.97	19.76	37.43	34.44
MEAN (%)	30.51	30.60	56.70	56.35	75.57	74.64	95.35	95.38

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PROPOR78=PROPOR79			SS		DF			
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -1.200	4371	0.231 #	2.66	187220.16	1	1230	0.017	0.895
B: -2.345	4371	0.019 #	20.63	13641.56	1	672	1.016	0.314
C: 0.995	4371	0.320 #	190.91	35054.35	1	890	4.847	0.028
D: 2.053	4371	0.040 #	0.39	27454.07	1	1573	0.022	0.881

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
GROUPS			SS		DF			
=====	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	67.89	66.43 #	1487.38	2116004.99	1	2788	1.960	0.162
LATE	67.68	64.55 #	3417.80	1044650.12	1	1359	4.577	0.033
MALE	65.95	64.23 #	1629.78	1725360.36	1	2232	2.108	0.147
FEMALE	70.05	67.69 #	2964.86	1554768.80	1	2137	4.075	0.044
NORTH	67.41	67.50 #	3.03	1273273.88	1	1518	0.004	0.952
SOUTH	68.26	65.17 #	6800.79	2019874.88	1	2851	5.599	0.002
PUBLIC	68.60	65.80 #	7099.38	2700788.77	1	3611	5.492	0.002
SEPARATE	64.70	66.55 #	650.19	590120.68	1	758	0.835	0.361

FIGURE 34



# OPERATIONS AND PROPERTIES

## LEVEL B (Grade 2)

OBJECTIVE 5

Solves picture and word problems.  
Estimates answers.

### TEST ITEMS

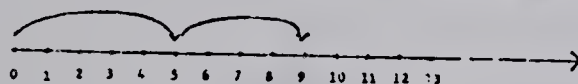
30. Pat lived 12 blocks from school.  
Jill lived 13 blocks from school.  
Pat walked to school and then walked to Jill's house.  
Write the number sentence to show how far she walked. \_\_\_\_\_  
How far did she walk? \_\_\_\_\_ blocks.

32. Ted had 35 cents.  
He spent 12 cents.

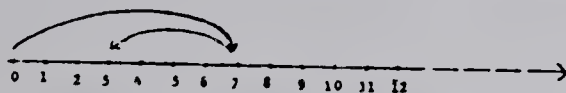
Write the number sentence to show how much he has left. \_\_\_\_\_

How much does he have left? \_\_\_\_\_c

31. Solve the number line problems. Fill in the boxes.



$$5 + \square = \square$$



$$7 - \square = \square$$

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR GRADE:2 STRAND:2 OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	42.68	39.66	14.37	12.42	27.23	30.19	15.72	17.73
MEAN (%)	16.71	18.17	50.73	50.57	73.15	73.41	99.56	95.67

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.027	4371	0.043	947.87	363058.30	1	1802	4.705	0.030
B:	1.894	4371	0.058	3.83	2987.33	1	586	0.751	0.387
C:	-2.168	4371	0.030	22.38	79517.73	1	1250	0.352	0.553
D:	-1.781	4371	0.075	2.13	2159.99	1	727	0.704	0.402

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	1978	1979	#						
EARLY	48.78	52.87	#	11563.62	3106514.39	1	2788	10.378	0.001
LATE	51.45	54.12	#	2488.07	1520535.76	1	1359	2.289	0.131
MALE	49.29	51.95	#	3945.68	2457913.60	1	2232	3.583	0.059
FEMALE	50.73	54.74	#	8610.27	2356271.25	1	2137	7.809	0.005
NORTH	46.87	47.42	#	112.11	1846615.41	1	1518	0.092	0.761
SOUTH	51.79	56.20	#	13868.36	2930790.67	1	2851	13.491	0.000
PUBLIC	50.69	52.27	#	2254.00	4083496.85	1	3611	1.993	0.158
SEPARATE	46.53	58.11	#	25458.06	719948.53	1	758	26.804	0.000

FIGURE 35



# OPERATIONS AND PROPERTIES

## LEVEL B (Grade 2)

OBJECTIVE 6

Adds and subtracts to 99 with no regrouping.

### TEST ITEMS

33. Solve the following:

$$\begin{array}{r} 85 \\ - 31 \\ \hline \end{array}$$

$$\begin{array}{r} 63 \\ + 25 \\ \hline \end{array}$$

$$\begin{array}{r} 54 \\ - 32 \\ \hline \end{array}$$

$$\begin{array}{r} 76 \\ + 21 \\ \hline \end{array}$$

$$\begin{array}{r} 69 \\ - 58 \\ \hline \end{array}$$

$$\begin{array}{r} 44 \\ + 35 \\ \hline \end{array}$$

$$\begin{array}{r} 96 \\ - 25 \\ \hline \end{array}$$

$$\begin{array}{r} 82 \\ - 41 \\ \hline \end{array}$$

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND:2 OBJECTIVE: 6  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	9.21	12.37	11.81	8.89	9.68	10.39	69.30	68.36
MEAN (%)	15.29	11.16	58.50	58.36	74.99	75.06	95.57	96.08

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -3.377	4371	0.001	#	1976.81	101594.13	1	466	9.067	0.003
B: 3.157	4371	0.002	#	2.34	15539.06	1	454	0.068	0.794
C: -0.774	4371	0.439	#	0.57	301.96	1	436	0.823	0.365
D: 0.673	4371	0.501	#	8.33	102038.49	1	3009	0.246	0.620

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	81.62	80.85	#	409.38	2107636.81	1	2788	0.542	0.462
LATE	83.21	79.59	#	4572.31	1030782.03	1	1399	6.206	0.013
MALE	80.39	77.86	#	3559.29	1823322.76	1	2232	4.357	0.037
FEMALE	83.87	82.30	#	1318.48	1465703.39	1	2137	1.922	0.166
NORTH	80.53	79.50	#	358.89	1257479.51	1	1518	0.467	0.495
SOUTH	82.98	80.30	#	5128.14	2065267.41	1	2851	7.291	0.007
PUBLIC	82.35	79.59	#	6856.37	2788547.52	1	3611	8.879	0.003
SEPARATE	80.80	82.10	#	320.70	514995.07	1	758	0.472	0.492

FIGURE 36



and subtraction algorithms with two digit numbers more successfully than the symbolizing of the operations. About eighty percent of pupils had scores between 65 and 100 percent on the two digit problems.

One-quarter of the grade two pupils did not understand the commutative property for addition.

Thirty-six percent of the students in both 1978 and 1979 had achievement scores at the 25 percent level on understanding the process of multiplication and division. Although significantly more pupils in 1979 achieved at the 85-100 percent level, this proportion only reached slightly over thirty percent.

Grade two's in Zone One did poorly on solving picture and word problems. Less than twenty percent of the population was able to reach the 85-100 percent level. Sub-group mean scores ranged from 47 to 58 percent.

#### MEASUREMENT (Ten objectives; Figures 37 to 46)

##### Hypothesis 1

One objective had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

##### Hypothesis 2

Eight objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.



## Findings

Grade two pupils had some difficulty with the time concepts. While close to seventy percent of the pupils in 1978 and 1979 could tell time (hour, half and quarter hour) to the 85-100 percent achievement level, only about twenty percent could write the time using standard notation to the same level. Similarly the calendar achievement figures were such that less than sixty percent of the pupils could read the dates on the calendar or recite the months of the year in order to the 85-100 percent level.

Achievement in the Metric System varied extensively from one concept to another. Only thirty percent of the grade two pupils could estimate and measure using the standard units of length (m, cm), capacity (L), and mass (kg) to the 85-100 percent criterion category. An additional fifty-five percent, however, had scores in categories B and C (50-84 percent) on this same objective.

Most pupils could identify all the proper measuring instruments for a given task. Performance means for all but one sub-group were in the low 90 percent and a significant increase of 1979 pupils (eighty-three percent) received 100 percent scores on the one item.

About three-quarters of the pupils in the zone in 1979 could read three of the four Celsius thermometer items to ten degree intervals. This represented a significant increase over the 1978 performance.

The money items in Figure 44 in particular gave many



## LEVEL B (Grade 2)

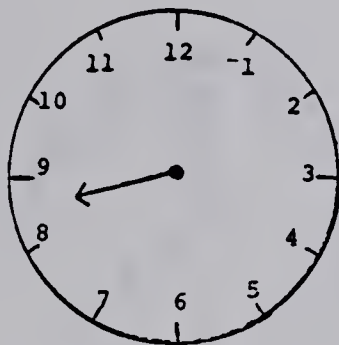
### MEASUREMENT

#### OBJECTIVE 1

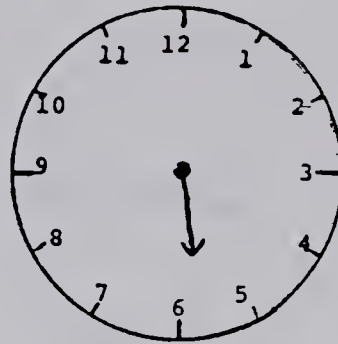
*Tells the time to hour, half hour, and quarter hour.*

### TEST ITEMS

9. Put the minute hand on each clock.



8 30



5 45

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:2 OBJECTIVE: 6  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	9.21	12.37	11.81	8.65	9.68	10.39	69.30	68.36
MEAN (%)	15.29	11.16	58.50	58.36	74.95	75.06	95.97	96.06

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-DF
A: -3.377	4371	0.001	#	1976.81	101594.13	1	466	5.067	0.003
B: 3.157	4371	0.002	#	2.34	15539.06	1	454	0.068	0.794
C: -0.774	4371	0.439	#	0.57	301.96	1	436	0.823	0.365
D: 0.673	4371	0.501	#	8.33	102038.45	1	3009	0.246	0.620

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-DF
=====	1978	1979	#						
EARLY	81.62	80.85	#	409.38	2107636.81	1	2768	0.542	0.462
LATE	83.21	79.59	#	4572.31	1030782.03	1	1399	6.206	0.013
MALE	80.39	77.86	#	3559.29	1823322.76	1	2232	4.357	0.037
FEMALE	83.87	82.30	#	1318.48	1465703.39	1	2137	1.922	0.166
NORTH	67.76	73.50	#	12824.51	2324476.48	1	1518	8.375	0.004
SOUTH	74.20	74.93	#	382.38	3877172.83	1	2851	0.281	0.596
PUBLIC	71.36	74.29	#	7755.82	5221871.92	1	3611	5.363	0.021
SEPARATE	74.23	75.40	#	262.84	999707.56	1	758	0.199	0.655

FIGURE 37











## LEVEL B (Grade 2)

## MEASUREMENT

**OBJECTIVE 4** Recites months of the year in order.

## TEST ITEMS

### Teacher Record of Lab Success

Circle the appropriate student response description.

28.

Correct / Incorrect

The student names months  
of year in order.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND:3 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	50.59	38.41	0.30	0.92	0.22	0.39	48.89	60.25
MEAN (%)	0.0	0.0	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

[illegible]

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
				SS		DF		E-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	47.26	52.72	#	90879.84	6808805.65	1	2788	37.213	0.000
LATE	53.71	64.58	#	41273.99	3319276.98	1	1399	17.393	0.000
MALE	40.57	54.60	#	109577.87	5418421.51	1	2232	45.138	0.000
FEMALE	58.28	67.72	#	47485.38	4901585.44	1	2137	20.703	0.000
NORTH	45.58	56.56	#	45179.79	3728688.41	1	1518	18.459	0.000
SOUTH	51.30	63.22	#	101248.36	6823060.70	1	2851	42.306	0.000
PUBLIC	48.63	59.04	#	97548.46	8805762.04	1	3611	40.001	0.000
SEPARATE	52.06	70.16	#	62214.43	1742140.84	1	788	27.069	0.000

FIGURE 40



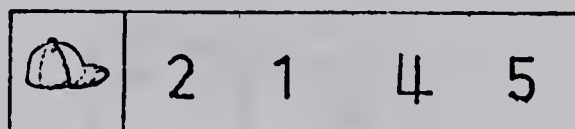
## LEVEL B (Grade 2)

### MEASUREMENT

**OBJECTIVE 5** *Estimates and uses standard units of length, capacity, and mass, m, cm, l, kg.*

#### TEST ITEMS

5. Draw a line 4 cm long.



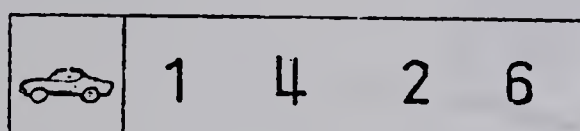
6. Draw a line 10 cm long.

29.

Correct / Incorrect

The student uses a 1 litre measure to determine the capacity of a 3 litre or 4 litre container.

7.



30.

Correct / Incorrect

The student uses a balance scale and kg weights to determine the mass of a 2 kg or 3 kg object.

#### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:2 STRAND:3 OBJECTIVE: 5  
 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	17.28	13.48	19.84	16.91	36.17	38.16	26.70	31.45
MEAN (%)	31.68	30.29	54.89	54.60	75.28	75.57	96.34	96.19

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	3.472	4371	0.001	#	318.04	103474.22	1	675	2.075	0.150
B:	2.498	4371	0.013	#	16.87	13709.04	1	805	0.990	0.320
C:	-1.363	4371	0.173	#	193.24	73357.28	1	1621	4.270	0.039
D:	-3.454	4371	0.001	#	7.71	21739.70	1	1264	0.448	0.503

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	68.92	71.98	#	6522.64	1468556.64	1	2788	12.383	0.001
LATE	70.12	72.48	#	1949.32	768238.34	1	1359	3.550	0.060
MALE	69.22	73.24	#	9004.12	1151124.08	1	2232	17.459	0.000
FEMALE	69.43	71.84	#	3111.14	1181936.26	1	2137	5.625	0.018
NORTH	67.07	67.70	#	147.49	827124.76	1	1518	0.271	0.603
SOUTH	70.62	74.92	#	13197.05	1476469.87	1	2851	25.483	0.000
PUBLIC	68.99	71.30	#	4801.19	1965736.64	1	3611	8.820	0.003
SEPARATE	70.94	78.27	#	10203.65	352335.73	1	758	21.952	0.000

FIGURE 41







## LEVEL B (Grade 2)



## LEVEL B (Grade 2)

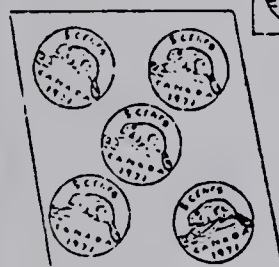
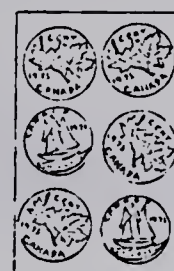
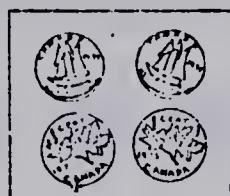
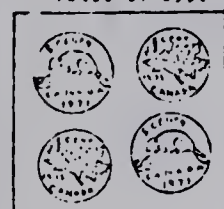
## MEASUREMENT

## OBJECTIVE 8

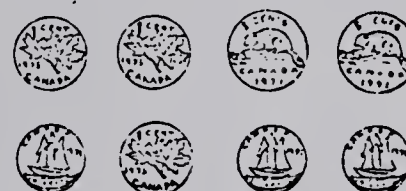
Counts collections of coins up to 25¢.

## TEST ITEMS

1k. Put an X on the two boxes of coins that have a value of 25¢.



17. Circle the coins to show how much the doll costs.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:2 STRAND:3 CEJECTIVE: 8

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	20.97	17.87	17.19	16.43	9.16	9.42	52.67	56.28
MEAN (%)	11.59	12.70	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				#	F-TEST					
HO: PRCPOR78=PROPOR79				#	SS		DF			
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VALUE
A:	2.582	4371	0.010	#	257.44	132869.76	1	851	1.649	0.199
B:	0.679	4371	0.497	#	<<<<<<<<<<<< SSW IS EQUAL TC ZERC >>>>>>>>>>>>					
C:	-0.294	4371	0.769	#	<<<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>>					
D:	-2.393	4371	0.017	#	<<<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		E-RATIO	PEOB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	70.34	74.45	#	11718.98	3432516.91	1	2788	5.519	0.002
LATE	70.63	71.85	#	515.84	1775684.20	1	1399	0.406	0.524
MALE	70.97	76.19	#	15119.77	2609396.79	1	2232	12.933	0.000
FEMALE	70.15	71.38	#	814.82	2787132.82	1	2137	0.625	0.425
NORTH	64.96	72.12	#	19251.58	2010840.52	1	1518	14.533	0.000
SOUTH	73.80	74.66	#	523.02	3353366.75	1	2851	0.445	0.505
PUBLIC	70.29	72.82	#	5777.89	4607529.61	1	3611	4.528	0.033
SEPARATE	71.97	78.43	#	7915.11	790021.73	1	758	7.587	0.006

FIGURE 44



## LEVEL B (Grade 2)

### MEASUREMENT

**OBJECTIVE 9**
*Gives equivalent value of coins to 25¢.*

### TEST ITEMS

19. How much money is there in each set of coins below? Write the answer in the blank.



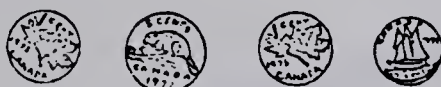
\_\_\_\_\_

21.



\_\_\_\_\_

20.



\_\_\_\_\_

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.

CRITERION CATEGORIES FOR GRADE:2 STRAND:3 OBJECTIVE: 9

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.54	14.54	5.86	5.17	26.79	24.69	50.80	55.60
MEAN (%)	9.73	12.76	50.62	50.23	73.41	72.78	99.84	95.88

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	1.822	4371	0.069	1543.66	133069.41	1	680	7.888	0.005
B:	1.001	4371	0.318	8.79	845.50	1	240	2.494	0.116
C:	1.589	4371	0.113	108.88	18558.13	1	1126	6.606	0.010
D:	-3.176	4371	0.002	0.96	2728.94	1	2319	0.818	0.366

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
GROUPS				SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	74.45	78.67	#	12075.46	2892657.12	1	2788	11.639	0.001
LATE	75.97	77.09	#	434.97	1401506.01	1	1359	0.434	0.510
MALE	74.88	79.28	#	10765.49	2178754.80	1	2232	11.029	0.001
FEMALE	75.05	76.58	#	1250.40	2327450.97	1	2137	1.148	0.284
NORTH	69.12	74.47	#	10751.32	1882001.93	1	1518	6.644	0.003
SOUTH	78.33	79.65	#	1243.03	2564433.79	1	2851	1.382	0.240
PUBLIC	75.06	76.92	#	3137.97	3782667.69	1	3611	2.996	0.084
SEPARATE	74.51	82.66	#	12631.02	717167.86	1	758	13.350	0.000

FIGURE 45







students trouble. While the mean scores on these items, for all sub-groups, were in the 70-80 percent range, over thirty percent of the pupils had achievement figures at or below the 50 percent level. Pupils did somewhat better on counting up the printed values of purchased items than they did on counting and giving equivalent values of sets of pictured coins (Figures 43-45).

GEOMETRY (Three objectives; Figures 47 to 48)

#### Hypothesis 1

No objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement level.

#### Hypothesis 2

One objective had a significant increase in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

#### Findings

About three-quarters of the pupils were able to classify 2 and 3-dimensional figures and objects according to various attributes within achievement categories C and D for both 1978 and 1979.

Significantly more pupils in 1979 were able to develop geometric patterns using 2-dimensional figures. Still only sixty-three percent of the zone one grade two pupils came within the 85-100 percent category.







## LEVEL B (Grade 2)

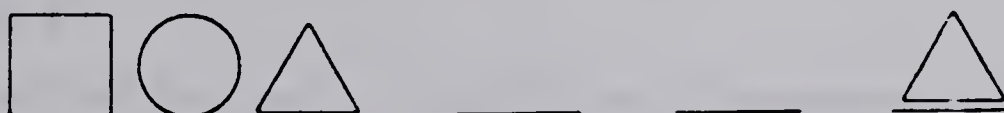
### GEOMETRY

#### OBJECTIVE 3

*Develops geometrical patterns using  
3-dimensional objects and  
2-dimensional figures.*

#### TEST ITEMS

23. Draw the missing shapes:



24.



25.



#### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.

CRITERION CATEGORIES FOR GRADE:2 STRAND:4 OBJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	23.23	18.21	1.74	1.30	16.15	17.10	58.88	63.38
MEAN (%)	12.24	12.95	50.42	50.00	70.81	69.84	99.93	99.98

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PRO78=PRO79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	4.078	4371	0.000	#	111.53	22248.36	1	910	0.457 0.495
B:	1.163	4371	0.245	#	2.80	131.94	1	65	1.379 0.245
C:	-0.842	4371	0.400	#	169.37	34341.27	1	724	3.571 0.059
D:	-3.048	4371	0.003	#	1.99	1033.82	1	2666	5.144 0.024

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	73.59	77.70	#	11755.02	3571080.00	1	2788	9.177	0.003
LATE	74.17	78.91	#	7832.61	1765744.10	1	1359	6.206	0.013
MALE	70.67	75.85	#	14909.86	3020186.75	1	2232	11.019	0.001
FEMALE	77.49	80.90	#	6207.69	2449114.37	1	2137	5.417	0.020
NORTH	74.86	80.22	#	10799.24	1881274.91	1	1518	8.714	0.003
SOUTH	73.49	77.40	#	10878.03	3623317.90	1	2851	8.559	0.004
PUBLIC	72.95	77.27	#	16772.54	4685517.57	1	3611	12.926	0.000
SEPARATE	79.15	83.15	#	3052.24	800751.76	1	788	2.889	0.090

FIGURE 48



## GRAPHING (Two objectives; Figures 49 and 50)

### Hypothesis 1

The null hypothesis held for the two objectives in the graphing strand. Neither had eighty percent of the pupils achieving in the 85-100 percent category for 1978 or 1979.

### Hypothesis 2

One objective had a significant increase in the 1979 proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

Less than seventy percent of the pupils in 1978 and 1979 were able to construct simple bar and pictographs at the 85-100 percent level. About one-quarter of the pupils could not make a bar graph from the information given in a comparative situation.

More students were able to locate the position of an object on a 10 to 10 grid. About seventy-five percent of the grade two's reached category D on the grid item.

## **A. DISCUSSION OF THE GRADE TWO RESULTS**

The mean achievement scores for Zone One pupils on the basis of objectives and strands are given in Table 8. The figures here and in Tables 9 and 10 indicate some of a parallel performance for the two years. Generally the objectives that gave students difficulty in 1978 also did so in 1979.

The overall achievement scores for grade two are



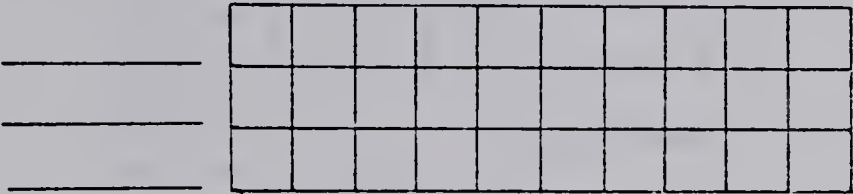
LEVEL B (Grade 2)

GRAPHING

OBJECTIVE 1 Constructs simple bar and pictographs using data collected from immediate environment.

TEST ITEMS

26. In Mrs. Brown's class, 10 children like art best, 5 like gym best, and 8 like music best. Make a bar graph to show what they like.



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D. CRITERION CATEGORIES FOR GRADE:2 STRAND:5 OBJECTIVE: 1 TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	27.96	25.17	4.26	3.29	4.65	3.96	63.14	67.58
MEAN (%)	3.27	4.73	50.00	50.00	68.85	68.60	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST			
MC: PRCPOR78=PRCPOR79				SS			
I-CALC				DF			
	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN
A:	2.087	4371	0.037	614.48	129560.99	1	1163
B:	1.676	4371	0.094	SSW IS EQUAL TO ZERO			
C:	1.112	4371	0.267	2.90	4671.56	1	1167
D:	-3.085	4371	0.002	SSW IS EQUAL TO ZERO			

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE			
SS			
DF			
GROUPS	YEARS	#	
	1978	1979	
EARLY	68.04	73.02	17231.64 5073689.41 1 2788 9.469 0.002
LATE	70.64	73.85	3594.75 2462468.28 1 1399 2.042 0.153
MALE	68.91	72.66	7847.06 4004771.71 1 2232 4.373 0.037
FEMALE	69.87	73.63	7532.68 3828567.14 1 2137 4.205 0.041
NORTH	64.94	63.67	612.39 3138627.19 1 1518 0.296 0.586
SOUTH	71.93	77.75	24116.49 4579273.27 1 2851 15.015 0.000
PUBLIC	67.88	70.79	7638.54 6806167.66 1 3611 4.053 0.044
SEPARATE	76.76	83.83	9479.49 950928.40 1 758 7.556 0.006

FIGURE 49



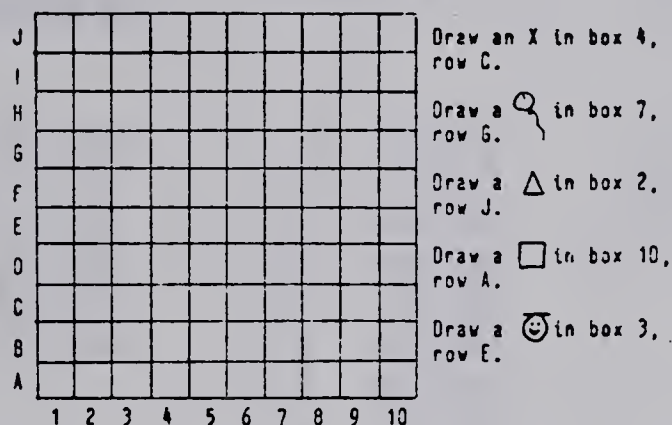
## LEVEL B (Grade 2)

### GRAPHING

**OBJECTIVE 2** *Locates position of an object on a 10 x 10 grid.*

### TEST ITEMS

27.



### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:2 STRAND:5 OBJECTIVE: 2

TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	12.81	10.58	3.21	2.95	12.33	12.13	71.65	74.35
MEAN (%)	6.54	9.25	59.59	58.69	79.98	79.90	99.58	99.95

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPR78=PROPR79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 2.286	4371	0.022	#	919.14	88723.91	1	512	5.304	0.022
B: 0.508	4371	0.611	#	27.45	982.92	1	133	3.714	0.056
C: 0.208	4371	0.836	#	0.90	147.42	1	533	3.239	0.072
D: -2.008	4371	0.045	#	0.00	424.36	1	3187	0.028	0.868

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	83.33	86.44	#	6672.01	2623589.68	1	2788	7.090	0.008
LATE	85.54	87.09	#	846.29	1222641.08	1	1399	0.968	0.325
MALE	82.66	86.45	#	7979.34	2155712.93	1	2232	8.262	0.004
FEMALE	85.92	87.03	#	658.21	1813249.03	1	2137	0.776	0.379
NORTH	77.83	82.48	#	8125.35	1912609.85	1	1518	6.449	0.011
SOUTH	87.95	88.81	#	519.90	1989601.24	1	2851	0.745	0.388
PUBLIC	83.40	86.14	#	6771.79	3471252.91	1	3611	7.043	0.008
SEPARATE	88.45	89.44	#	183.09	491853.62	1	758	0.282	0.595

FIGURE 50



TABLE 8  
THE 1978 AND 1979 ZONE ONE MEAN SCORES FOR GRADE  
TWO BY OBJECTIVES AND STRAND

ZONE ONE		GRADE TWO		JUNE/78					
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	91.7%	1	64.5%	1	71.8%	1	75.3%	1	69.4%
2	95.5%	2	71.1%	2	64.9%	2	75.3%	2	84.3%
3	92.6%	3	60.6%	3	68.2%	3	74.0%		
4	86.4%	4	67.9%	4	49.2%				
5	65.1%	5	50.0%	5	69.3%				
6	91.3%	6	82.1%	6	88.8%				
7	75.3%			7	80.0%				
				8	70.6%				
				9	75.0%				
				10	77.1%				
<hr/>									
AVG	85.4%		66.0%		70.0%		74.9%		76.8%

ZONE ONE		GRADE TWO				JUNE/79			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	90.6%	1	71.2%	1	74.5%	1	76.9%	1	73.1%
2	95.0%	2	76.9%	2	53.7%	2	76.9%	2	86.7%
3	91.5%	3	61.6%	3	68.6%	3	78.3%		
4	83.9%	4	65.9%	4	61.0%				
5	67.9%	5	53.3%	5	72.6%				
6	92.6%	6	80.0%	6	90.8%				
7	77.1%			7	82.3%				
				8	73.8%				
				9	78.0%				
				10	79.6%				
-----									
AVG	85.5%		68.2%		73.5%		77.4%		79.9%

reasonably good. Some of the performances within the Operations and Properties and Measurement strands tend to lower the overall means for these strands. The grade two



TABLE 9

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	2.65	2.85	6.64	5.12	26.96	27.34	63.74	64.65
MEAN (%)	37.31	31.82	58.66	58.71	76.51	76.62	93.56	93.75

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FECH	
A: -0.407	4371	0.684	905.62	24288.25	1	118	4.400	0.038	
B: 2.130	4371	0.033	0.13	4531.03	1	257	0.008	0.931	
C: -0.281	4371	0.779	3.69	33324.69	1	1185	0.131	0.717	
D: -0.649	4371	0.516	20.46	71334.77	1	2805	0.804	0.370	

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	24.71	20.05	17.85	17.83	31.52	34.78	25.92	27.34
MEAN (%)	33.55	34.29	57.23	57.26	75.07	74.71	92.08	91.74

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FECH	
A: 3.683	4371	0.000	132.98	136487.22	1	982	0.957	0.328	
B: 0.017	4371	0.986	0.13	13234.64	1	778	0.007	0.931	
C: -2.287	4371	0.022	46.69	47968.05	1	1444	1.406	0.236	
D: -1.061	4371	0.299	35.06	25442.15	1	1161	1.600	0.206	

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	15.94	11.50	18.02	15.31	38.12	41.11	27.92	32.08
MEAN (%)	33.48	35.45	57.84	58.57	75.17	75.50	91.48	91.65

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FECH	
A: 4.244	4371	0.000	558.74	94576.84	1	603	3.562	0.060	
B: 2.393	4371	0.017	97.14	13008.94	1	730	5.451	0.020	
C: -2.017	4371	0.044	46.92	54220.05	1	1727	1.495	0.222	
D: -2.998	4371	0.003	13.60	26994.89	1	1305	0.660	0.417	



TABLE 10

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE GEOMETRY AND GRAPHING STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND: GEOMETRY  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	12.42	9.86	14.16	11.16	34.30	36.47	39.12	42.51
MEAN (%)	26.95	26.70	57.04	57.13	76.77	77.21	94.82	94.60

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HC: PRCPOR78=PRCPOR79	#		SS	DF				
T-CALC	DE	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.683	4371	0.007 #	7.86	124548.66	1	488	0.031 0.861
B:	2.967	4371	0.003 #	1.06	12257.36	1	555	0.048 0.827
C:	-1.499	4371	0.134 #	76.87	57335.86	1	1543	2.069 0.151
D:	-2.278	4371	0.023 #	20.62	36002.39	1	1779	1.019 0.313

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:2 STRAND: GRAPHING  
TOTAL NUMBER OF PUPILS: 1978 N=2303 1979 N=2070

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	13.85	11.50	17.33	15.46	9.60	9.47	59.23	63.57
MEAN (%)	16.47	19.24	50.91	50.74	76.11	75.61	98.62	98.66

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HC: PRCPOR78=PRCPOR79	#		SS	DF				
T-CALC	DE	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.331	4371	0.020 #	1044.77	169736.26	1	555	3.416 0.065
B:	1.662	4371	0.097 #	5.04	4951.90	1	717	0.729 0.393
C:	0.143	4371	0.886 #	25.59	15904.92	1	415	0.668 0.414
D:	-2.947	4371	0.003 #	0.89	31799.31	1	2678	0.075 0.785



program contains twenty-eight objectives as opposed to the eighteen in grade one. Statistical comparisons between the grades are not possible however.

### Number

The grade two performance on the number strand appears to be adequate. Table 9 shows that over ninety percent of the grade two children achieved within Categories C and D.

The concept of place value which was of concern in grade one was also weak in grade two. This topic permeates the total mathematics program at the elementary level and so any lack of pupil understanding will undoubtedly affect, not only the other number objectives, but some of the other strands as well. Since one quarter of the grade ones had difficulty, one could perhaps expect an increase in this failure proportion in grade two. This was in fact the situation.

Although the introduction of the common fractions one half and one quarter caused a few grade two's problems, the general reduction in the emphasis on fractions appears to have given a greater proportion of pupils some opportunity to succeed.

### Operations and Properties

The distribution of achievement proportions given in Table 9 is indicative of some difficulties within this strand.

One obvious factor is that only about one-third of the pupils have committed the basic facts for addition and



subtraction to memory. Grade two pupils did better on the addition and subtraction algorithms with two digits (Figure 36) than on the basic recall of the facts. The assumption might be that memorization has low priority with teachers.

It appears as though pupils may be introduced too quickly to the multiplication and division operations. Pupils should have shown a better grasp of adding and subtracting before they were introduced into the other two operations. This is supported in part by the low achievement figures for problem solving which involves making a choice about which operation to use. Teachers may be taking the listing of objectives in the 1977 Handbook as an indication of the sequence for teaching. This possibility should be eliminated.

### Measurement

The distribution of achievement scores within the four categories as given in Table 9 may indicate that this strand is too demanding of grade two pupils.

The three objectives on money are very much dependent on the understanding of some of the Number and Operations concepts. Thus the difficulties which students have with counting coin collections or using coins for making small purchases likely stem from problems with basic number understanding.

The first entry of the Metric System with the skills of estimating and using the standard units of length (m, cm), capacity (L) and mass (g) appear to be in line with the



capabilities of grade two pupils. The scores are low enough however to be of concern for the future extension of Metric measurement as a system.

### Geometry

Most students in grade two experience a fair degree of success with the geometry objectives. However the requirements represent only a minimum extension of the grade one program. The format of the items measuring this strand may have confused some of the pupils in the lower achievement categories as they are somewhat complicated.

### Graphing

It is somewhat surprising to find that students experienced more success with the locating of objects on a 10 x 10 grid than with the constructing of simple bar or pictographs. If objective 2 (Figure 50) was to be interpreted in the ordered pair form (1,2), which it sometimes is, the achievement picture may have been different.



## CHAPTER VI

### GRADE THREE

#### ANALYSIS OF HYPOTHESIS ONE AND TWO FOR GRADE THREE

NUMBER (Seven objectives; Figures 52 to 58)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

##### Hypothesis 2

Two objectives had significant increases in the proportion of pupils achieving at the 85-100 percent category from 1978 to 1979.

##### Findings

Slightly over seventy percent of the zone one pupils in both 1978 and 1979 achieved within category D (85-100 percent) in the order and betweenness concepts and on the use of symbols for equality and inequality. Sub-group means on the same were in the area of 85 percent.

Students have some difficulties with counting by 2's, 5's, 10's and 25's. Only about forty-five percent of these children performed at the 85-100 percent level.

Approximatley twenty percent of the pupils achieved well below 50 percent. Performance on this skill remained fairly constant over the two testing periods.



PART	QUESTION	STRAND	OBJ.	RAW SCORE VALUE	W
II	1	Geometry	1	4	1
II	2	Geometry	1	4	1
II	3	Measurement	2	4	1
II	4	Graphing	3	10	2½
II	5	Graphing	4	4	1
II	6	Graphing	1	2	½
II	7	Geometry	4	4	1
II	8	Graphing	2	4	1
II	9	Graphing	2	4	1
II	10	Graphing	2	4	1
II	11	Measurement	6	4	1
II	12	Measurement	1	4	1
II	13	Measurement	3	4	1
II	14	Measurement	3	4	1
II	15	Measurement	4	8	2
II	16	Measurement	5	8	2
II	17	Measurement	9	4	1
II	18	Measurement	8	20	5
II	19	Geometry	2	12	3
II	20	Measurement	7	6	1½
II	21	Measurement	7	6	1½
II	22	Geometry	3	20	5

PART	QUESTION	STRAND	OBJ.	RAW SCORE VALUE	W
I	1	Operat. & Prop.	1	1	½
I	2	Operat. & Prop.	2	1	½
I	3	Operat. & Prop.	1	1	½
I	4	Operat. & Prop.	1	1	½
I	5	Number	3	20	5
I	6	Number	6	4	1
I	7	Number	6	4	1
I	8	Number	6	4	1
I	9	Number	6	4	1
I	10	Number	3	4	1
I	11	Number	3	4	1
I	12	Number	3	4	1
I	13	Operat. & Prop.	6	2	½
I	14	Operat. & Prop.	6	2	½
I	15	Operat. & Prop.	6	2	½
I	16	Operat. & Prop.	6	2	½
I	17	Number	7	2	½
I	18	Number	7	2	½
I	19	Number	7	2	½
I	20	Number	7	2	½
I	21	Number	7	2	½
I	22	Number	7	2	½
I	23	Number	7	2	½
I	24	Number	7	2	½
I	25	Number	7	2	½

FIGURE 51  
GRADE THREE DETAILED ANALYSIS OF MARK WEIGHTINGS



# LEVEL C (Grade 3)

## NUMBER

### OBJECTIVE 1

Orders and determines "betweenness" of whole numbers (0-1 000) and understands symbols  $>$ ,  $<$  and  $=$  to show relationships.

### TEST ITEMS

36. Place  $>$ ,  $<$  or  $=$  inside each circle.

a) 15  8

d) 101  110

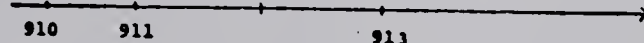
b) 81  18

e) 97  98

c) 732  372

f) 909  909

37. Write in the missing number.



### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 1

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	61.49	6.63	10.25	11.71	9.57	10.11	73.69	71.55
MEAN (%)	30.85	28.00	53.11	52.92	76.56	76.50	97.42	97.28

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST		
HC: PRCPOR78=PRCPOR79	#		SS	DF	
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN WITHIN
A: -0.178	3720	0.859	494.22	57856.09	1 242
B: -1.427	3720	0.154	3.59	8588.32	1 406
C: -0.552	3720	0.581	0.27	8292.90	1 364
D: 1.468	3720	0.143	12.97	52626.37	1 2702
					E-RATIO PROB
					2.067 0.152
					0.170 0.681
					0.012 0.913
					0.666 0.415

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE					
GROUPS	YEARS	#	SS	DF	
=====	1978	1979	BETWEEN	WITHIN	BETWEEN WITHIN
EARLY	86.49	85.06	1249.09	1168276.49	1 2438
LATE	87.20	85.50	876.62	532238.47	1 1204
MALE	85.48	85.17	47.08	942739.80	1 1920
FEMALE	87.72	85.62	1976.13	786855.82	1 1798
NORTH	88.41	84.70	3375.28	458404.93	1 981
SOUTH	85.88	85.63	42.21	1270943.39	1 2737
PUBLIC	86.84	85.99	527.91	1339856.71	1 2941
SEPARATE	85.53	83.09	1156.76	389172.32	1 777
					E-RATIO PROB
					2.607 0.107
					1.983 0.159
					0.096 0.757
					4.516 0.034
					7.223 0.007
					0.091 0.763
					1.159 0.282
					2.310 0.129

FIGURE 52



## LEVEL C (Grade 3)

### NUMBER

**OBJECTIVE 2** *Identifies multiples by counting by 2's, 5's, 10's, 25's, 100's (0 - 1 000)*

### TEST ITEMS

32. Fill in the blanks:

a) Count by 2's.

\_\_\_\_\_, \_\_\_\_\_, 6, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

b) Count by 25's.

\_\_\_\_\_, \_\_\_\_\_, 75, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

c) Count by 5's.

125, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

d) Count by 10's.

360, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 2

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	22.75	20.33	15.38	14.36	16.84	20.66	45.03	44.64
MEAN (%)	19.31	19.23	50.06	50.24	75.04	75.00	99.96	99.96

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: 1.794	3720	0.073	1.43	91225.51	1	801	0.013	0.911	
B: 0.867	3720	0.386	4.30	960.34	1	552	2.474	0.116	
C: -2.989	3720	0.003	0.26	77.64	1	694	2.331	0.127	
D: 0.239	3720	0.811	0.01	817.47	1	1667	0.020	0.887	

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS			SS		DF				
=====			BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
YEARS	1978	1979							
EARLY	69.00	70.93	2263.32	2599974.12	1	2438	2.122	0.145	
LATE	71.05	71.29	16.68	1224824.61	1	1204	0.016	0.898	
MALE	70.52	73.34	3816.64	2066124.26	1	1920	3.547	0.060	
FEMALE	68.90	69.02	6.62	1814602.75	1	1758	0.007	0.935	
NORTH	69.16	65.56	3171.80	1088065.09	1	981	2.860	0.091	
SOUTH	69.95	73.22	7309.96	2781816.81	1	2737	7.192	0.007	
PUBLIC	70.20	71.84	1991.87	3041208.63	1	2941	1.926	0.165	
SEPARATE	68.04	68.97	167.59	845285.61	1	777	0.154	0.695	

FIGURE 53



# LEVEL C (Grade 3)

## NUMBER

OBJECTIVE 3 Reads and writes numerals. (0 - 9 999).

### TEST ITEMS

5. In the boxes below, write the numbers that your teacher tells you to write.

A.

D.

B.

E.

C.

10.

Now look at question 10. Write the number seven hundred thirty-five--  
seven hundred thirty five.

Now look at question 11. Write the number nine hundred eight--nine  
hundred eight.

11.

Now look at question 12. Write the number seven thousand sixty-two--  
seven thousand sixty-two.

12.

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	19.35	17.79	16.95	18.90	8.84	9.72	54.86	53.59
MEAN (%)	18.46	19.55	58.07	57.24	75.00	75.05	97.18	97.35

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	1.224	3720	0.221	#	201.92	150644.47	1	690	0.925 0.337
B:	-1.551	3720	0.121	#	116.30	24381.30	1	664	3.167 0.076
C:	-0.930	3720	0.352	#	0.24	810.05	1	343	0.104 0.748
D:	0.779	3720	0.436	#	14.48	53391.60	1	2017	0.547 0.460

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
EARLY	73.52	73.51	#	0.13	2420199.82	1	2438	0.000	0.991
LATE	73.42	73.40	#	0.15	1105775.41	1	1204	0.000	0.990
MALE	74.30	74.83	#	133.02	1860188.64	1	1920	0.137	0.711
FEMALE	72.35	72.63	#	35.23	1730921.26	1	1798	0.037	0.848
NORTH	76.36	69.60	#	11191.51	928761.94	1	981	11.821	0.001
SOUTH	72.25	75.20	#	5980.78	2649113.83	1	2737	6.179	0.013
PUBLIC	73.40	74.21	#	484.31	2853583.91	1	2941	0.499	0.480
SEPARATE	73.19	72.02	#	267.73	740084.91	1	777	0.281	0.596

FIGURE 54



## LEVEL C (Grade 3)

### NUMBER

#### OBJECTIVE 4

*Identifies the number of 1 000's, 100's, 10's, 1's and tenths.*

### TEST ITEMS

33. Fill in the blanks:

5 026.8 \_\_\_\_\_ hundreds \_\_\_\_\_ tenths \_\_\_\_\_ thousands \_\_\_\_\_ ones \_\_\_\_\_ tens

172.5 \_\_\_\_\_ tens \_\_\_\_\_ hundreds \_\_\_\_\_ ones \_\_\_\_\_ tenths \_\_\_\_\_ thousands

7 132.4 \_\_\_\_\_ thousand \_\_\_\_\_ tens \_\_\_\_\_ hundreds \_\_\_\_\_ tenths \_\_\_\_\_ ones

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 4

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	53.14	49.94	0.42	0.17	12.81	14.64	33.63	35.25
MEAN (%)	5.44	5.25	52.08	55.56	67.62	66.98	99.90	99.99

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
H0: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A: 1.942	3720	0.052	16.12	284232.69	1	1918	0.109	0.742	
B: 1.419	3720	0.156	26.30	150.46	1	9	1.573	0.241	
C: -1.620	3720	0.105	51.80	4334.91	1	508	6.071	0.014	
D: -1.039	3720	0.259	2.63	617.98	1	1279	5.443	0.020	

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
			1978	1979					
EARLY	46.45	48.09	#	1639.51	4860219.53	1	2438	0.822	0.365
LATE	44.17	45.86	#	860.10	2402414.78	1	1204	0.431	0.512
MALE	44.56	47.72	#	4786.64	3810951.35	1	1920	2.412	0.121
FEMALE	46.23	47.82	#	1131.24	3602093.73	1	1758	0.565	0.453
NORTH	48.43	42.49	#	8666.75	1910710.73	1	981	4.450	0.035
SOUTH	44.23	49.60	#	19733.93	5479479.18	1	2737	9.857	0.002
PUBLIC	46.67	48.76	#	3211.14	5887434.93	1	2941	1.604	0.206
SEPARATE	40.49	43.96	#	2334.48	1507893.56	1	777	1.203	0.273

FIGURE 55



## LEVEL C (Grade 3)

### NUMBER

**OBJECTIVE 5** *Rewrites numbers in expanded notation (0 - 1 000) and vice versa.*

### TEST ITEMS

30. Fill in the blanks:

a)  $691 = 600 + \underline{\hspace{2cm}} + 1$

b)  $403 = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + 3$

c)  $69 = 60 + \underline{\hspace{2cm}}$

d)  $919 = 900 + \underline{\hspace{2cm}} + 9$

e)  $710 = 700 + \underline{\hspace{2cm}}$

34. Write the number for these:

a) 1 hundred 4 tens 2 ones =                     

b) 7 tens 3 ones =                     

c) 8 hundreds 1 one =                     

d) 3 hundreds 6 tens 5 ones =                     

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 5  
 TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	9.73	10.17	2.04	2.93	51.10	49.67	37.13	37.24
MEAN (%)	10.75	12.71	52.14	52.93	73.22	73.09	97.28	97.07

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PROPOR78=PROPOR79			SS		DF			
I-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO
A: -0.446	3720	0.656	#	354.85	87745.66	1	368	1.488
B: -1.745	3720	0.081	#	14.32	816.00	1	90	1.579
C: 0.872	3720	0.383	#	8.61	33904.10	1	1874	0.476
D: -0.065	3720	0.948	#	14.27	21279.33	1	1382	0.927

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
GROUPS			SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO
EARLY	75.37	75.05	#	62.54	160497.45	1	2438	0.095
LATE	76.25	75.68	#	99.59	720844.35	1	1204	0.166
MALE	75.73	76.17	#	94.97	1282524.34	1	1920	0.142
FEMALE	75.56	74.35	#	653.87	1073727.46	1	1798	1.095
NORTH	76.67	71.77	#	5882.57	588436.66	1	981	9.807
SOUTH	75.27	76.52	#	1061.80	1760784.60	1	2737	1.650
PUBLIC	76.47	75.84	#	298.30	1848663.06	1	2941	0.467
SEPARATE	72.57	73.19	#	74.56	802135.38	1	777	0.115

FIGURE 56



# LEVEL C (Grade 3)

## NUMBER

OBJECTIVE 6 Reads and writes decimals to tenths.

## TEST ITEMS

Say, "For each of the next questions on this page, I will read a number, and I want you to write this number on the line provided. Use decimals."

6.

Look at question 6. Write the number sixty one and nine tenths on the line--write sixty one and nine tenths in decimals.

7.

Now look at question 7. Write the number two hundred eighty and five tenths on the line--write two hundred eighty and five tenths.

Now look at question 8. Write the number eleven and six tenths--eleven and six tenths.

8.

Now look at question 9. Write the number ninety-eight and seven tenths on the line--ninety-eight and seven tenths.

9.

## ANALYSIS

### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:1 DEJECTIVE: 6

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	29.08	21.38	3.45	4.64	12.71	12.38	54.76	61.60
MEAN (%)	2.87	4.28	50.09	50.15	75.03	75.00	100.00	99.98

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: PRCPOR78=PRCPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	5.397	3720	0.000	#	455.74	70999.56	1	941	6.040 0.014
B:	-1.844	3720	0.065	#	0.11	192.86	1	148	0.083 0.774
C:	0.307	3720	0.759	#	0.08	38.90	1	465	0.922 0.338
D:	-4.229	3720	0.000	#	0.27	311.94	1	2160	1.880 0.171

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	67.80	73.07	#	16905.44	4071765.14	1	2438	10.122	0.002
LATE	65.11	75.10	#	30022.43	2045007.02	1	1204	17.676	0.000
MALE	65.27	73.92	#	35962.51	3258648.67	1	1920	21.189	0.000
FEMALE	68.57	74.32	#	14867.45	2950770.03	1	1798	9.059	0.003
NORTH	73.28	66.15	#	12449.54	1670012.95	1	981	7.313	0.007
SOUTH	64.48	76.88	#	105192.98	4475659.75	1	2737	64.329	0.000
PUBLIC	65.19	75.73	#	81647.09	4906689.62	1	2941	48.938	0.000
SEPARATE	73.08	67.93	#	5154.79	1270099.14	1	777	3.154	0.076

FIGURE 57



# LEVEL C (Grade 3)

## NUMBER

### OBJECTIVE 7

Identifies, writes and compares fractions from physical representation (halves, quarters, tenths, and fifths).

## TEST ITEMS

For questions 17 and 18 you can look at the diagram below. Circle the fraction which shows the greater amount.



18.

$$\frac{5}{10}$$

$$\frac{2}{5}$$

17.

$$\frac{1}{2}$$

$$\frac{3}{4}$$

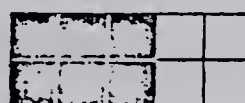
23.



26.



24.



27.



25.



28.



## ANALYSIS

### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.

CRITERION CATEGORIES FOR GRADE:3 STRAND:1 OBJECTIVE: 7

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.42	13.37	8.58	8.18	42.57	40.99	32.43	37.46
MEAN (%)	27.47	25.93	55.44	54.50	76.72	76.44	97.31	97.26

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
H0: PROPOR78=PROPOR79			SS		DF		F-RATIO	PROB
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN		
A: 2.611	3720	0.009	323.45	98121.04	1	554	1.826	0.177
B: 0.441	3720	0.659	67.65	5100.40	1	310	4.111	0.043
C: 0.976	3720	0.329	29.73	79327.99	1	1554	0.582	0.446
D: -3.220	3720	0.001	0.90	19905.37	1	1256	0.059	0.809

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE			SS		DF		F-RATIO	PROB
GROUPS	YEARS	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979						
EARLY	73.24	75.57	3300.33	1492035.90	1	2438	5.393	0.020
LATE	74.26	74.82	96.22	732866.69	1	1204	0.158	0.691
MALE	72.53	74.75	2347.86	1194143.22	1	1920	3.775	0.052
FEMALE	74.50	76.70	2168.88	1065050.41	1	1798	3.661	0.056
NORTH	77.12	72.60	5016.67	536927.13	1	981	9.166	0.003
SOUTH	72.14	76.77	14678.33	1710456.28	1	2737	23.488	0.000
PUBLIC	73.42	76.34	6240.93	1858252.36	1	2941	9.877	0.002
SEPARATE	73.71	73.23	44.34	401630.35	1	777	0.086	0.770

FIGURE 58



All four of the objectives dealing with place-value related knowledge had rather low achievement ratings. About fifty percent of the pupils in 1978 and 1979 could not identify the numbers of 1000's, 100's, 10's, 1's and tenths in numbers. Mean scores for all sub-groups were below the 50 percent level. Somewhat better performance was recorded for reading and writing the numerals 0-999 and decimals to tenths. From fifty to sixty percent of the pupils in 1978 and 1979 could handle these reading and writing skills to the 85-100 percent level. About one in five could not. Over eighty-five percent of the pupils could rewrite numerals in expanded notations (0-1000) and vice versa to the C and D achievement levels (65-100 percent). Half of this group were in category C, however.

Pupils did moderately well at identifying, writing and comparing fractions (halves, quarters, fifths and tenths). The proportion of grade three's achieving in category D increased significantly for this skill in 1979. Sub-group means reached the 75 percent level and the largest proportion of pupils, was in the 65-84 percent level.

OPERATIONS AND PROPERTIES (Nine objectives; Figures 59 to 67)

### Hypothesis 1

None of the objectives had performances where eighty percent Zone One pupils in 1978 and 1979 were at the 85-100 percent achievement level.



## Hypothesis 2

There were no significant increases in the proportion of pupils achieving within category D (85-100 percent) from 1978 to 1979.

## Findings

About one quarter of the Zone One pupils in 1979 could identify all four additive, subtractive, multiplicative and division situations. Sub-group means for this skill ranged from 65 to 69 percent.

At least two-thirds of the pupils could add and subtract two and three digit numbers within categories C and D (65-100 percent).

Most Zone One pupils can symbolize multiplication and division situations. About seventy percent of the grade three group worked to the 100 percent level.

Pupils did have difficulty with identifying related sentences for the four operations. Only twenty-eight percent of the group were in category D (85-100) on this skill and over thirty percent of the 1979 pupils were at or below 64 percent.

Pupil understanding of the unique affect of 0 and 1 in addition and multiplication respectively was somewhat low. Thirty-eight percent of the students were in the 85-100 percent level while approximately the same number had marks of 64 percent or less.

Performance on the basic facts in the four operations to 18 was low. The test item checked for both speed and



OPERATIONS  
AND PROPERTIES

OBJECTIVE 1

LEVEL C (Grade 3)

Identifies additive, subtractive,  
multiplicative and divisive situations.

TEST ITEMS

44. Put a check mark (✓) in the box that tells you what to do to find the answer to each problem.

A. Bill had 11 marbles. There was a hole in his bag. He lost 6 of them. How many marbles has he left?

☐ Add
 ☐ Subtract
 ☐ Multiply
 ☐ Divide

B. Patti picked 12 flowers. She put 4 flowers in each vase. How many vases did she use?

☐ Add
 ☐ Subtract
 ☐ Multiply
 ☐ Divide

C. There were 8 books on a shelf. Chris put 3 more books on the shelf. How many books are on the shelf now?

☐ Add
 ☐ Subtract
 ☐ Multiply
 ☐ Divide

D. The class lined up by twos. There are 9 groups of two. How many children were there?

☐ Add
 ☐ Subtract
 ☐ Multiply
 ☐ Divide

3. Watch your teacher. Put a check mark (✓) in the box that tells what she is doing.

1. Watch your teacher. Put a check mark (✓) in the box that tells what she is doing.

- ☐ Add
 ☐ Multiply
- ☐ Subtract
 ☐ Divide

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 1  
 TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	14.33	16.80	19.87	20.94	37.34	36.57	28.45	25.69
MEAN (%)	30.93	29.93	53.29	53.08	74.86	74.51	97.72	97.85

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
PROPORTION TEST				F-TEST						
HO: PROPOR78=PROPOR79				SS		DF				
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	-2.075	3720	0.038	#	143.09	91780.81	1	576	0.898	0.344
B:	-0.806	3720	0.421	#	8.46	12435.72	1	757	0.515	0.473
C:	0.485	3720	0.627	#	42.29	74757.00	1	1374	0.777	0.378
D:	1.894	3720	0.058	#	4.36	13695.94	1	1007	0.321	0.571

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS  
 F-TEST TABLE

GROUPS	YEARS		#	SS		DF		E-RATIO	PROB
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	70.22	68.46	#	1874.55	1462757.32	1	2438	3.124	0.077
LATE	71.96	67.58	#	5775.26	612718.21	1	1204	11.348	0.001
MALE	59.59	67.51	#	2077.72	1155409.31	1	1920	3.453	0.063
FEMALE	72.06	69.62	#	2686.51	957033.24	1	1798	5.047	0.025
NORTH	72.00	65.99	#	8847.22	588462.60	1	981	14.749	0.000
SOUTH	70.33	69.42	#	574.85	1523806.82	1	2737	1.033	0.310
PUBLIC	72.00	68.73	#	7266.47	1665338.79	1	2941	13.892	0.000
SEPARATE	66.21	67.76	#	462.84	441069.40	1	777	0.815	0.367

FIGURE 59



# OPERATIONS AND PROPERTIES

## LEVEL C (Grade 3)

### OBJECTIVE 2

Adds and subtracts two or three digit numbers with and without regrouping.

### TEST ITEMS

41. Add:

$$\begin{array}{r} 814 \\ + 107 \\ \hline \end{array}$$

$$\begin{array}{r} 726 \\ + 176 \\ \hline \end{array}$$

$$\begin{array}{r} 439 \\ + 272 \\ \hline \end{array}$$

42. Subtract:

$$\begin{array}{r} 662 \\ - 524 \\ \hline \end{array}$$

$$\begin{array}{r} 426 \\ - 131 \\ \hline \end{array}$$

43. Answer the following:

$$\begin{array}{r} 26 \\ - 14 \\ \hline \end{array}$$

$$\begin{array}{r} 389 \\ + 412 \\ \hline \end{array}$$

$$\begin{array}{r} 682 \\ - 216 \\ \hline \end{array}$$

834

$$\begin{array}{r} - 246 \\ \hline \end{array}$$

$$\begin{array}{r} 92 \\ + 16 \\ \hline \end{array}$$

$$\begin{array}{r} 64 \\ - 25 \\ \hline \end{array}$$

$$\begin{array}{r} 461 \\ + 248 \\ \hline \end{array}$$

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	14.54	17.51	15.12	15.25	27.46	26.13	42.89	41.10
MEAN (%)	23.02	24.87	54.99	54.66	76.95	76.51	96.15	96.25

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
H0: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -2.475	3720	0.014	#	505.25	123871.67	1	593	2.419	0.120
B: -0.113	3720	0.910	#	14.78	9597.43	1	563	0.867	0.352
C: 0.912	3720	0.362	#	49.50	43470.68	1	996	1.134	0.287
D: 1.101	3720	0.271	#	4.30	26888.05	1	1562	0.250	0.617

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	73.69	72.65	#	657.66	1801414.85	1	2438	0.890	0.346
LATE	75.15	71.19	#	4716.88	819078.84	1	1204	6.934	0.009
MALE	70.11	69.59	#	131.52	1527111.06	1	1920	0.165	0.684
FEMALE	78.23	75.08	#	4464.58	1099631.67	1	1798	7.300	0.007
NORTH	73.74	69.58	#	4234.30	756230.33	1	981	5.493	0.019
SOUTH	74.13	73.18	#	621.32	1911067.38	1	2737	0.890	0.346
PUBLIC	75.12	72.65	#	4457.53	2025171.40	1	2941	6.473	0.011
SEPARATE	69.95	70.70	#	110.46	637001.89	1	777	0.135	0.714

FIGURE 60



# OPERATIONS AND PROPERTIES

**OBJECTIVE 3** Symbolizes multiplication and division situations.

## TEST ITEMS

39. Put the correct sign in the box (+ - ÷ x)

$$3 \square 3 = 9$$
$$7 \quad \boxed{\phantom{00}} \quad 4 = 11$$
 $18 \square 2 = 9$ 
$$11 \quad \square \quad 8 = 3$$

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	8.00	8.73	10.98	8.73	12.45	12.82	68.57	69.72
MEAN (%)	12.09	10.92	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

F-TEST									
PROPORTION TEST									
H0: PRCPOR78=PRCPOR79	#			SS	DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: -0.801	3720	0.423	#	107.09	48172.65	1	309	0.687	0.408
B: 2.303	3720	0.021	#	<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>			
C: -0.340	3720	0.734	#	<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>			
D: -0.764	3720	0.445	#	<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>			

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	83.80	84.55	#	340.66	1924937.01	1	2438	0.431	0.511
LATE	85.61	84.33	#	492.52	831607.40	1	1204	0.713	0.399
MALE	84.70	83.74	#	435.39	1501890.31	1	1920	0.557	0.456
FEMALE	84.00	85.62	#	1178.18	1300618.70	1	1798	1.629	0.202
NORTH	82.17	81.64	#	69.49	866640.83	1	981	0.079	0.779
SOUTH	85.17	85.70	#	193.53	1928568.76	1	2737	0.275	0.600
PUBLIC	84.80	84.81	#	0.08	2175935.61	1	2941	0.000	0.992
SEPARATE	82.74	84.07	#	344.80	626875.99	1	777	0.427	0.513

FIGURE 61



# OPERATIONS AND PROPERTIES

## LEVEL C (Grade 3)

### OBJECTIVE 4

Identifies related sentences for addition, subtraction, multiplication and division.

### TEST ITEMS

38. Circle the two number sentences that tell the same story.

- a)  $3 + 3 = 6$
- b)  $6 \times 3 = 18$
- c)  $2 \times 3 = 6$
- d)  $6 - 3 = 3$

45. Write the correct number sentence or equation for each problem.

A. There were 15 trees. A man cut down 9 of them. How many were left?

\_\_\_\_\_ - \_\_\_\_\_ = \_\_\_\_\_

B. There were 12 birds on a branch. They flew away in groups of threes. How many groups were there?

\_\_\_\_\_ ÷ \_\_\_\_\_ = \_\_\_\_\_

C. Bill has 3 boxes of marbles. There are 5 marbles in each box. How many marbles has he?

\_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

D. In our room there are 13 boys and 16 girls. How many children are in our class?

\_\_\_\_\_ + \_\_\_\_\_ = \_\_\_\_\_

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	18.99	18.73	11.61	13.76	40.32	38.73	29.08	28.78
MEAN (%)	22.36	22.98	50.71	50.33	74.91	75.12	99.66	99.82

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		BF			
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	0.200	3720	0.842	68.32	133939.77	1	700	0.357	0.550
B:	-1.968	3720	0.049	16.82	1873.07	1	469	4.211	0.041
C:	0.995	3720	0.320	15.48	100817.66	1	1470	0.226	0.635
D:	0.198	3720	0.843	7.66	2278.91	1	1075	3.614	0.058

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		E-RATIO	F-RATIO
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	F-RATIO
EARLY	69.05	68.83	#	27.93	1990574.04	1	2438	0.034	0.853
LATE	70.06	68.55	#	683.17	930990.00	1	1204	0.884	0.347
MALE	68.04	68.65	#	180.35	1652023.53	1	1920	0.210	0.647
FEMALE	70.70	69.49	#	660.83	1322138.20	1	1798	0.899	0.343
NORTH	70.59	62.42	#	16368.33	877310.46	1	981	18.303	0.000
SOUTH	68.85	71.36	#	4320.57	2071690.96	1	2737	5.708	0.017
PUBLIC	69.83	69.42	#	125.92	2398104.62	1	2941	0.154	0.694
SEPARATE	67.41	67.67	#	12.89	576971.67	1	777	0.017	0.895

FIGURE 62







## OPERATIONS AND PROPERTIES

### LEVEL C (Grade 3)

## OBJECTIVE 6

Understands the unique effect of 0 and 1 in addition and multiplication respectively.

## TEST ITEMS

13. When 1 is added to a number the answer is:

- ☐ One less than the number.
- ☐ The same as the number.
- ☐ 1
- ☐ One more than the number.

15. When a number is added to 0 the answer is:

- ☐ The same as the number.
- ☐ One more than the number.
- ☐ 0
- ☐ One less than the number.

14. When a number is multiplied by 1, the answer is:

- ☐ The same as the number.
- ☐ 0
- ☐ 1
- ☐ One more than the number.

16. When a number is multiplied by 0, the answer is:

- ☐ The same as the number.
- ☐ One more than the number.
- ☐ 0
- ☐ One less than the number.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 6  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	15.48	15.14	19.40	20.94	22.96	25.41	42.15	38.51
MEAN (%)	19.21	18.29	50.00	50.03	75.00	75.00	99.98	99.96

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PRCPOR78=PRPOR79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	0.290	3720	0.772 #	120.62	66832.23	1	568	1.025	0.312
B:	-1.167	3720	0.244 #	0.20	155.84	1	748	0.979	0.323
C:	-1.748	3720	0.081 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	2.266	3720	0.024 #	0.15	467.66	1	1501	0.497	0.481

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

		F-TEST TABLE							
GROUPS	YEARS		#	SS		DF		E-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	70.68	70.66	#	0.15	2145682.16	1	2438	0.000	0.989
LATE	74.76	70.44	#	5615.71	1022356.54	1	1204	6.613	0.010
MALE	70.06	70.05	#	0.07	1716481.13	1	1920	0.000	0.993
FEMALE	74.17	71.60	#	2983.42	1501079.08	1	1798	3.574	0.059
NORTH	75.87	67.99	#	15240.88	835390.48	1	981	17.897	0.000
SOUTH	70.63	71.78	#	904.02	2375979.53	1	2737	1.041	0.308
PUBLIC	72.85	70.30	#	4807.37	2515204.84	1	2941	5.621	0.018
SEPARATE	69.03	72.73	#	2669.44	705073.26	1	777	2.942	0.087

FIGURE 64



# OPERATIONS AND PROPERTIES

## LEVEL C (Grade 3)

### OBJECTIVE 7

*Demonstrates mastery of basic facts involving sums, minuends, products and dividends to 18.*

### TEST ITEMS

29. On this page you are to do some basic facts quickly. Start when your teacher says "Go" and stop when she says "Stop."

$6 + 2 =$ _____	$10 \div 5 =$ _____
$4 \times 4 =$ _____	$15 - 8 =$ _____
$14 \div 7 =$ _____	$11 - 6 =$ _____
$18 - 5 =$ _____	$18 \div 3 =$ _____
$9 \div 3 =$ _____	$5 \times 3 =$ _____
$6 \times 2 =$ _____	$2 \times 5 =$ _____
$9 + 9 =$ _____	$16 \div 4 =$ _____
$12 - 9 =$ _____	$6 + 8 =$ _____
$16 \div 8 =$ _____	$10 \div 2 =$ _____
$8 \times 2 =$ _____	$9 \times 2 =$ _____
$4 + 11 =$ _____	$3 \times 3 =$ _____
$8 + 7 =$ _____	$18 \div 2 =$ _____

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 7

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	25.58	27.46	16.42	16.80	19.72	19.72	38.28	36.02
MEAN (%)	29.17	29.69	56.24	56.95	75.96	75.50	95.29	95.13

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PROPOR78=PROPOR79			SS		DF		F-RATIO	PROB
T-CALC	DE	PRCB	BETWEEN	WITHIN	BETWEEN	WITHIN		
A: -1.301	3720	0.194 #	68.76	163906.49	1	984	0.413	0.521
B: -0.306	3720	0.760 #	78.36	13471.20	1	616	3.583	0.059
C: -0.005	3720	0.996 #	38.74	27339.30	1	732	1.037	0.309
D: 1.427	3720	0.154 #	9.07	27606.12	1	1382	0.454	0.501

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
			SS		DF		F-RATIO	PROB
GROUPS	YEARS	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979						
EARLY	67.47	67.23 #	35.35	1901095.00	1	2438	0.045	0.831
LATE	69.71	65.72 #	4778.44	885395.63	1	1204	6.498	0.011
MALE	66.30	64.65 #	1320.93	1561515.95	1	1920	1.624	0.203
FEMALE	70.14	69.25 #	359.13	1268273.50	1	1758	0.509	0.476
NORTH	68.55	64.53 #	3967.05	779695.28	1	981	4.991	0.026
SOUTH	68.01	67.70 #	67.10	2063105.38	1	2737	0.089	0.766
PUBLIC	68.78	67.21 #	1827.29	2227791.59	1	2941	2.412	0.121
SEPARATE	65.81	65.62 #	6.90	615041.41	1	777	0.009	0.926

FIGURE 65



### LEVEL C (Grade 3)

## OPERATIONS AND PROPERTIES

**OBJECTIVE 8** Multiplies whole numbers by 10 and 100.

## TEST ITEMS

40. Put a check mark (✓) in the box in front of the correct answer.

a)  $4 \times 10 = \square$  400

40

☐ 4 000

04

b)  $100 \times 7 = \square 7\,000$

☐ 700

70

☐ 70 000

c)  $2 \times 100 = \boxed{\phantom{000}} \quad 200$

☐ 2 000

20

☐ 2

d)  $6 \times 10 = \square 6\ 000$

60

**600**

6

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 8

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	10.04	8.78	9.47	9.12	13.28	15.36	67.21	66.74
MEAN (%)	10.16	8.02	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST				F-TEST					
	HO: PROPOR78=PROPOR79	#			SS		DF			
	T-CALC	DF	PBOB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FFOB
A:	1.312	3720	0.190	#	397.33	50596.26	1	349	2.741	0.099
B:	0.368	3720	0.713	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
C:	-1.807	3720	0.071	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
D:	0.303	3720	0.762	#	<<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE-SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		E-RATIO	F-POS
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	81.91	82.97	#	690.77	2125042.84	1	2438	0.792	0.373
LATE	85.37	83.90	#	647.03	909313.58	1	1204	0.857	0.355
MALE	81.94	83.13	#	672.11	1741939.75	1	1920	0.741	0.390
FEMALE	83.98	83.94	#	0.53	1349921.35	1	1798	0.001	0.979
NORTH	83.96	81.53	#	1450.06	883000.60	1	981	1.611	0.205
SOUTH	82.54	84.21	#	1920.54	2207869.07	1	2737	2.381	0.123
PUBLIC	83.52	83.89	#	97.32	2400568.35	1	2941	0.119	0.730
SEPARATE	80.69	82.13	#	403.42	689699.27	1	777	0.454	0.500

FIGURE 66



OPERATIONS  
AND PROPERTIES

LEVEL C (Grade 3)

OBJECTIVE 9 Solves word problems. Estimates Answers.

TEST ITEMS

46. Put a check mark (✓) in the box that you believe is closest to the right answer to the following problem.

Billy lives 15 blocks from school. He knows that he can walk 2 blocks in 5 minutes. If he must be at school in 10 minutes will he:

- ☐ get there with some time left over.
- ☐ get there right on time.
- ☐ would not have enough time to get there.

48. Betty had some money in her bank. Grandmother gave her 5 dollars.

Now Betty has 8 dollars.

How much had she before Grandmother gave her the 5 dollars?

Write a number sentence or equation and solve.

47. There are 4 birds on a fence. Then 5 birds came and sat on the fence beside them. How many birds are sitting on the fence now?

Give the number sentence or equation and solve.

49. Chris has a large fish tank. One day he took all the fish and put them in 3 smaller tanks. Now there are 5 fish in each of the 3 smaller tanks. How many fish were in the large aquarium?

Write a number sentence or equation and solve the problem.

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:2 OBJECTIVE: 9

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	31.59	33.48	26.67	29.67	22.12	19.28	19.61	17.57
MEAN (%)	20.18	22.03	53.26	53.65	74.82	75.04	96.35	96.44

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HC: PROPOR78=PROPOR79			SS		DF			
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO PROB
A:	-1.231	3720	0.219 #	1037.23	159749.96	1	1208	6.273 0.012
B:	-2.031	3720	0.042 #	40.76	32486.62	1	1045	1.311 0.252
C:	2.137	3720	0.033 #	8.69	533.13	1	770	12.545 0.000
D:	1.601	3720	0.110 #	1.48	22073.52	1	691	0.046 0.830

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE			F-TEST TABLE					
GROUPS			SS		DF			
YEARS	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO PROB
EARLY	56.50	54.37	#	2743.14	2138609.25	1	2438	3.127 0.077
LATE	55.35	54.73	#	114.05	946423.83	1	1204	0.145 0.703
MALE	55.20	54.96	#	27.64	1653432.13	1	1920	0.032 0.858
FEMALE	56.93	54.44	#	2779.34	1484987.24	1	1798	3.365 0.067
NORTH	58.22	50.71	#	13844.33	868925.57	1	961	15.630 0.000
SOUTH	55.22	56.10	#	525.45	2257589.65	1	2737	0.637 0.425
PUBLIC	56.80	55.10	#	2106.43	2514736.10	1	2941	2.463 0.117
SEPARATE	53.17	53.18	#	0.03	619949.03	1	777	0.000 0.995

FIGURE 67



accuracy and only thirty-six percent of the 1979 pupils responded at the 85-100 percent level. Forty-three percent of the pupils in both testing years had achievement scores at or below 64 percent.

Very poor results were found for solving word problems and estimating answers. More than sixty percent of the Zone One population received scores at or below the 64 percent figure. All sub-groups had achievement means at the mid-50 percent level.

#### MEASUREMENT (Nine objectives; Figures 68 to 76)

##### Hypothesis 1

One objective in measurement had performances whereby eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

##### Hypothesis 2

Two objectives had significant increases in the proportions of students achieving at the 85-100 percent criterion in 1979 over 1978.

##### Findings

About three-quarters of the pupils in 1978 and 1979 could tell and write time to the nearest hour, half hour and quarter hour with 100 percent accuracy. Pupils improved significantly in 1979 in being able to write the months of the year in order. The achievement figures for this skill were much the same as those for time. Two thirds of the students could use the terms noon, midnight, a.m., and p.m.







### LEVEL C (Grade 3)

## MEASUREMENT

**OBJECTIVE 2** Knows the months of the year in order.

## TEST ITEMS

3. Rewrite these months in order: July, June, September, November, January, April, December, March, August, February, May, October.

January, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:3 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	32.37	22.93	0.16	0.17	0.26	0.17	67.21	76.74
MEAN (%)	0.04	0.12	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PRCPOR78=PRPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	6.431	3720	0.000 #	1.59	1867.97	1	1032	0.881	0.348
B:	-0.067	3720	0.946 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	0.631	3720	0.529 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-6.463	3720	0.000 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		\$S		DF		E-RATIO	PEOP
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	65.17	75.21	#	61391.48	5037608.52	1	2438	25.711	0.000
LATE	72.47	80.61	#	19957.59	2147646.06	1	1204	11.188	0.001
MALE	57.65	70.25	#	76222.34	4337280.52	1	1920	33.742	0.000
FEMALE	78.06	84.11	#	16448.37	2744076.29	1	1798	10.777	0.001
NORTH	63.23	75.37	#	36176.10	2060911.89	1	981	17.220	0.000
SOUTH	69.07	77.53	#	48982.15	5291716.10	1	2737	25.335	0.000
PUBLIC	67.44	78.36	#	87714.50	5730721.20	1	2941	45.015	0.000
SEPARATE	67.70	71.67	#	306	23042.45	1	777	1.466	0.226

FIGURE 69



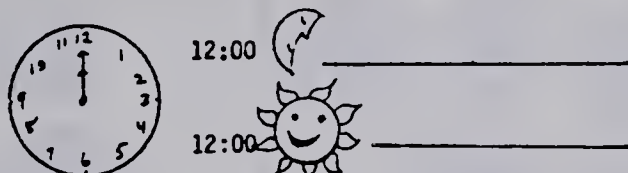
### LEVEL C (Grade 3)

## MEASUREMENT

**OBJECTIVE 3** Uses noon, midnight, a.m. and p.m.

## TEST ITEMS

13. Put noon or midnight in the blanks.



14. Put a.m. or p.m. in the blanks.

9:00 \_\_\_\_\_ is time for  
school to start.

3:30 \_\_\_\_\_ is time for  
school to finish.

8:00 \_\_\_\_\_ is the time  
to go to bed.

7:00 \_\_\_\_\_ is the time  
to get up in the morning.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:3 DEJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	7.90	9.01	13.96	15.80	10.20	9.06	67.94	66.13
MEAN (%)	16.06	13.34	52.95	52.58	75.00	75.00	98.61	98.72

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
	PROPORTION TEST			#	F-TEST					
	HO: PRCPOR78=PRPOR79			#	SS		DF			
	I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	-1.216	3720	0.224	#	578.24	76408.22	1	312	2.361	0.125
B:	-1.575	3720	0.116	#	18.98	14838.05	1	551	0.705	0.402
C:	1.175	3720	0.240	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	1.172	3720	0.241	#	6.38	37249.66	1	2494	0.427	0.513

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----									
F-TEST TABLE									
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
EARLY	82.99	81.15	#	2067.88	1872708.70	1	2438	2.692	0.101
LATE	84.20	82.38	#	997.44	801867.02	1	1204	1.498	0.221
MALE	81.68	79.68	#	1917.37	1521663.21	1	1920	2.419	0.120
FEMALE	85.06	83.61	#	940.78	1199214.69	1	1798	1.411	0.235
NORTH	82.80	78.56	#	4407.91	744091.26	1	981	5.811	0.016
SOUTH	83.50	82.64	#	501.57	1983277.86	1	2737	0.692	0.406
PUBLIC	82.88	81.56	#	1288.42	2248615.06	1	2941	1.685	0.194
SEPARATE	84.90	81.70	#	1992.71	483406.04	1	777	3.203	0.074

FIGURE 70



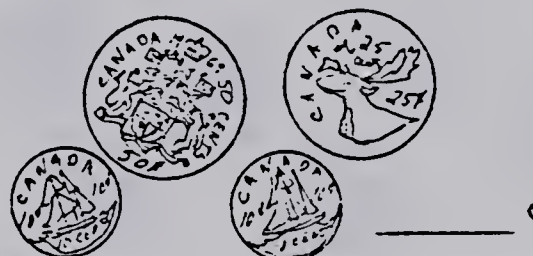
## LEVEL C (Grade 3)

## MEASUREMENT

**OBJECTIVE 4** Counts collections of coins up to \$1.00.

## TEST ITEMS

15. In the blanks, write how much money there is in each group of coins.



## ANALYSIS

\_ZONE ONE\_ \_PUPILS\_ \_IN\_ \_1978\_ \_AND\_ \_1979\_ \_ACHIEVING\_ \_WITHIN\_ \_EACH\_ \_CATEGORY\_ \_A-D\_

CRITERION CATEGORIES FOR GRADE:3 STRAND:3 OBJECTIVE: 4

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	15.43	15.08	16.16	14.81	28.14	28.07	40.27	42.04
MEAN (%)	14.24	12.04	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PROPOR78=PROPOR79			#	SS		BF			
	T-CALC	DE	PROR	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROR
A:	0.293	3720	0.769	#	683.24	87646.16	1	566	4.412	0.036
B:	1.141	3720	0.254	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	0.049	3720	0.961	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-1.09E	3720	0.272	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	F-CRIT
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	71.27	71.98	#	310.09	2361554.60	1	2438	0.320	0.572
LATE	72.39	72.99	#	108.63	1094953.04	1	1204	0.119	0.730
MALE	73.33	74.50	#	657.63	1724989.24	1	1920	0.732	0.392
FEMALE	69.85	69.99	#	8.87	1801916.13	1	1758	0.009	0.925
NORTH	70.98	68.76	#	1203.03	971460.37	1	981	1.215	0.271
SOUTH	71.90	73.55	#	1854.88	2562206.71	1	2737	1.981	0.160
PUBLIC	71.68	72.22	#	211.96	2778122.75	1	2941	0.224	0.636
SEPARATE	71.53	72.67	#	249.22	763731.85	1	777	0.254	0.615

FIGURE 71



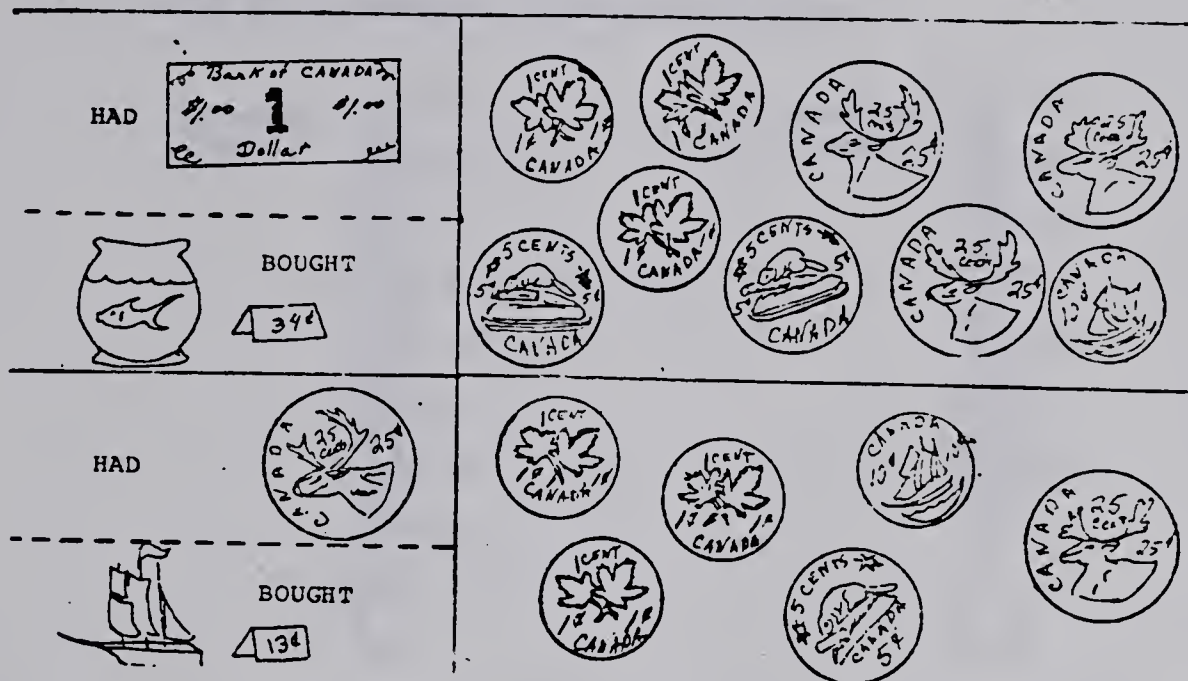
## LEVEL C (Grade 3)

## MEASUREMENT

**OBJECTIVE 5** *Makes purchases and change up to \$1.00.*

## TEST ITEMS

16. Circle the coins you would get for change if you bought these:



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:3 OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	43.15	42.54	31.12	33.15	0.47	0.22	25.26	24.09
MEAN (%)	0.30	0.34	50.02	50.00	75.00	75.00	99.74	100.00

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST									
	HO: PRCPOR78=PRPOR79	#		SS	DF	BETWEEN	WITHIN	F-RATIO	F-TEST
A:	0.374	3720	0.708 #	0.57	13116.00	1	1593	0.069	0.792
B:	-1.326	3720	0.185 #	0.13	155.99	1	1193	1.008	0.316
C:	1.291	3720	0.157 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	0.830	3720	0.407 #	15.35	1530.15	1	917	9.198	0.003

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PEOE
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	42.05	41.73	#	61.42	3939671.93	1	2438	0.038	0.645
LATE	40.05	38.63	#	605.49	1864259.25	1	1204	0.391	0.532
MALE	40.92	42.13	#	697.56	3052204.37	1	1920	0.439	0.508
FEMALE	41.55	39.75	#	1530.78	2895413.67	1	1798	0.951	0.330
NORTH	40.65	34.48	#	9343.84	1570766.48	1	981	5.836	0.016
SOUTH	41.47	43.23	#	2136.56	4352793.27	1	2737	1.343	0.247
PUBLIC	42.03	40.87	#	980.53	4774834.64	1	2941	0.604	0.437
SEPARATE	38.34	41.37	#	1787.00	1171142.64	1	777	1.186	0.277

FIGURE 72







## LEVEL C (Grade 3)

### MEASUREMENT

#### OBJECTIVE 7

*Extends estimation and measurement to include the use of the standard units km, dm.*

### TEST ITEMS

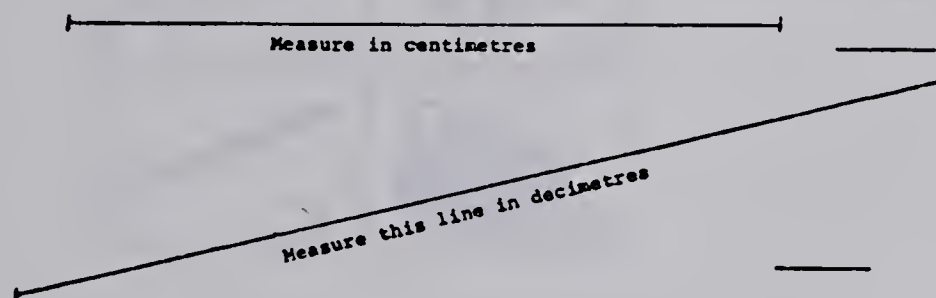
20. Estimate the width of this test paper in centimetres.  
Circle your estimate.

10 cm      20 cm      30 cm      40 cm

- Estimate the length of this test paper in decimetres.  
Circle your estimate.

1 dm      3 dm      5 dm      6 dm

21. Use your rulers to measure the lines below. Show your answer on the blank.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:3 OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	32.01	31.71	23.22	24.70	24.79	25.25	19.98	18.34
MEAN (%)	20.26	19.48	51.33	50.78	75.32	75.20	99.76	99.75

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
H0: PROPOR78=PROPOR79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 0.193	3720	0.847	#	179.41	199621.51	1	1184	1.064	0.303
B: -1.054	3720	0.292	#	67.28	6784.73	1	889	8.816	0.003
C: -0.322	3720	0.747	#	3.12	10003.59	1	929	0.290	0.590
D: 1.267	3720	0.205	#	0.02	1415.42	1	712	0.011	0.917

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	57.44	55.58	#	2095.59	2303800.10	1	2438	2.218	0.137
LATE	56.99	56.54	#	63.23	1115745.69	1	1204	0.068	0.794
MALE	57.35	56.61	#	263.47	1826264.30	1	1920	0.277	0.599
FEMALE	56.64	55.36	#	737.53	1669895.18	1	1758	0.794	0.373
NORTH	59.35	52.00	#	13250.98	945169.95	1	981	13.753	0.000
SOUTH	56.14	57.40	#	1076.08	2527954.18	1	2737	1.160	0.282
PUBLIC	57.79	54.42	#	8335.69	2781939.72	1	2941	8.812	0.003
SEPARATE	54.10	62.07	#	12328.40	693452.34	1	777	13.814	0.000

FIGURE 74



### LEVEL C (Grade 3)

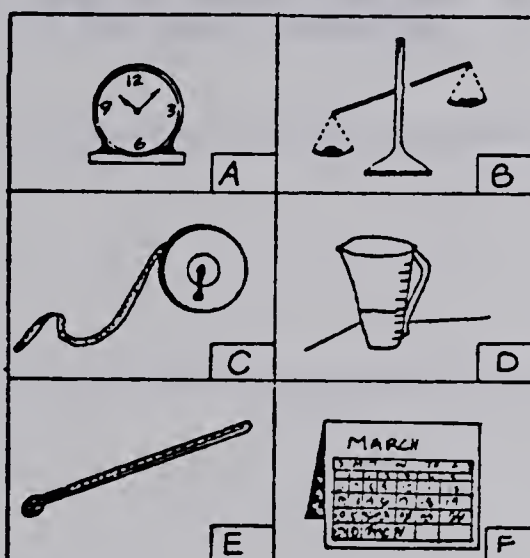
## MEASUREMENT

## OBJECTIVE 8

Uses standard instruments, (metre stick, litre container, mass scales, calendar, Celsius thermometer).

## TEST ITEMS

18. Place the letter from the correct box that answers each question.



How heavy? \_\_\_\_\_

How long? \_\_\_\_\_

How warm? \_\_\_\_\_

What day? \_\_\_\_\_

How much water? \_\_\_\_\_

## ANALYSIS

-ZONE ONE--PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D-

CRITERION CATEGORIES FOR GRADE:3 STRAND:3 OBJECTIVE: 8

	GRADE 10	GRADE 11	GRADE 12	TOTAL
NUMBER OF PUPILS:	1978 N=1912	1979 N=1810	1980 N=1710	1981 N=1610

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	7.32	8.12	2.09	2.54	8.00	5.69	82.58	83.65
MEAN (%)	4.68	4.46	60.00	59.35	80.00	80.00	99.99	100.00

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

--- PROPORTION TEST ---		#		F-TEST	

HO: PROPOR78=PROPOR79	SS	DF
-----------------------	----	----

TEST	OF	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FFCB
------	----	--------	---------	--------	---------	--------	---------	------

A:	-0.914	3720	0.361 #	3.56	36467.00	1	285	0.028	0.668
B:	-0.912	3720	0.362 #	9.10	280.43	1	84	2.726	0.102
C:	2.785	3720	0.006 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-0.865	3720	0.387 #	0.03	99.94	1	3051	0.959	0.328

### -----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

### F-TEST TABLE

GROUPS	YEARS		#	SS		DF		F-RATIO	FProb
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	90.06	88.50	#	1474.08	1852655.38	1	2438	1.940	0.164
LATE	92.07	93.07	#	305.87	610578.13	1	1204	0.603	0.438
MALE	89.67	89.55	#	39.01	1370812.83	1	1920	0.055	0.815
FEMALE	91.56	90.19	#	835.22	1172458.65	1	1798	1.281	0.258
NORTH	90.43	89.27	#	326.69	707058.66	1	981	0.453	0.501
SOUTH	90.63	90.35	#	56.66	1837527.95	1	2737	0.084	0.772
PUBLIC	90.58	89.56	#	753.74	2066750.86	1	2941	1.073	0.301
SEPARATE	90.58	92.00	#	391.22	476488.30	1	777	0.638	0.425

FIGURE 75



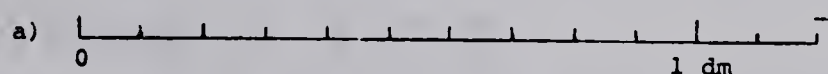
### LEVEL C (Grade 3)

## MEASUREMENT

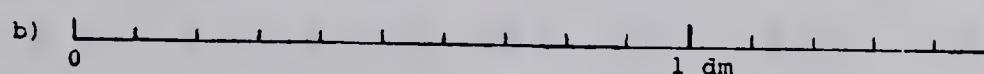
**OBJECTIVE 9** Expresses linear measurement to the nearest tenth.

## TEST ITEMS

17. Write the answer in the box. Use decimals to show the length of the lines in decimetres.



dm



dm

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:3 DEJECTIVE: 9

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	59.10	54.14	5.39	5.64	0.21	0.06	35.30	40.17
MEAN (%)	0.0	0.10	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST									
HO: PROPOR78=PROPOR79 #				F-TEST					
				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	3.050	3720	0.002 #	5.46	2489.80	1	2108	4.627	0.032
B:	-0.332	3720	0.740 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	1.282	3720	0.200 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-3.060	3720	0.002 #	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	F-CR
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	38.52	42.52	#	9760.15	5492891.24	1	2438	4.332	0.038
LATE	38.42	42.12	#	4120.88	2757923.07	1	1204	1.799	0.180
MALE	36.67	43.24	#	20745.05	4305164.16	1	1920	9.252	0.002
FEMALE	39.75	42.91	#	4489.36	4110882.52	1	1798	1.964	0.161
NORTH	43.75	34.58	#	20602.53	2178212.33	1	981	9.279	0.002
SOUTH	36.09	46.03	#	67763.21	6174842.21	1	2737	30.036	0.000
PUBLIC	39.97	40.92	#	668.06	6703825.23	1	2941	0.293	0.588
SEPARATE	31.37	51.33	#	77477.85	1661045.90	1	777	36.242	0.000

FIGURE 76



without errors.

Money measurement caused many students difficulty. Seventy percent of the pupils counted coin collections up to \$1.00 with 75 or 100 percent accuracy (4 items). Nearly the same proportion of students could manage only 50 percent or less when coin representations were used for making purchases and change up to \$1.00.

The metric system objectives (Figures 73, 74, and 75) showed mixed performance figures. About sixty percent of the pupils in 1978 and 1979 could read the Celsius thermometer to one degree intervals with 100 percent accuracy. Another twenty-two percent could correctly record temperatures for one of the two thermometers.

Under twenty percent of the pupils in 1979 could estimate and measure using centimetres and decimetres with 100 percent accuracy. Over fifty percent of the grade three pupils correctly estimated and measured one or two of the four items correctly.

One out of every two pupils could not express linear measures to tenths. The proportion who could write the decimal form to the 85-100 percent level increased significantly in 1979 but only to forty percent of the pupils.

GEOMETRY (Four objectives; Figures 77 to 80)

#### Hypothesis 1

One objective had performances where eighty percent of



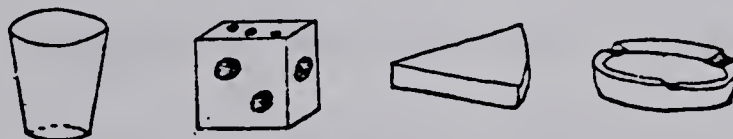
### LEVEL C (Grade 3)

## GEOMETRY

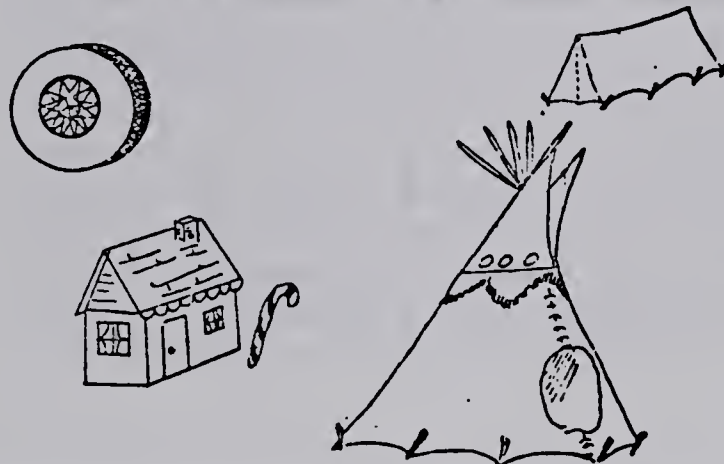
**OBJECTIVE 1** Classifies and identifies 2-dimensional figures and 3-dimensional objects.

## TEST ITEMS

1. Put an X on the picture of the item that is like a cube.



2. Put an X on the picture of the item that is like a cone.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:4 OBJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	3.61	3.43	8.84	9.34	0.0	0.11	87.55	87.13
MEAN (%)	0.54	2.42	50.00	50.15	*****	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	<u>PROPORTION TEST</u>			#	<u>F-TEST</u>					
	HO: PRCPOR78=PRCPOR79			#	SS		DF			
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	FEOS
A:	0.303	3720	0.762	#	114.92	4460.47	1	129	3.323	0.071
B:	-0.529	3720	0.557	#	1.85	308.80	1	336	2.012	0.157
C:	-1.454	3720	0.146	#	<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>					
D:	0.390	3720	0.697	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>					

### ----- COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS -----

		F-TEST TABLE							
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	91.35	91.72	#	84.41	1298478.85	1	2438	0.158	0.691
LATE	93.25	92.74	#	76.38	535423.85	1	1204	0.172	0.679
MALE	91.50	91.42	#	3.57	1037189.22	1	1920	0.007	0.935
FEMALE	92.52	92.57	#	1.22	843933.16	1	1798	0.003	0.959
NORTH	91.42	91.01	#	42.83	518655.03	1	981	0.081	0.776
SOUTH	92.20	92.31	#	8.44	1362740.17	1	2737	0.017	0.896
PUBLIC	92.36	91.71	#	310.77	1479798.92	1	2941	0.618	0.432
SEPARATE	90.63	93.00	#	1096.99	400560.94	1	777	2.126	0.145

FIGURE 77



## LEVEL C (Grade 3)

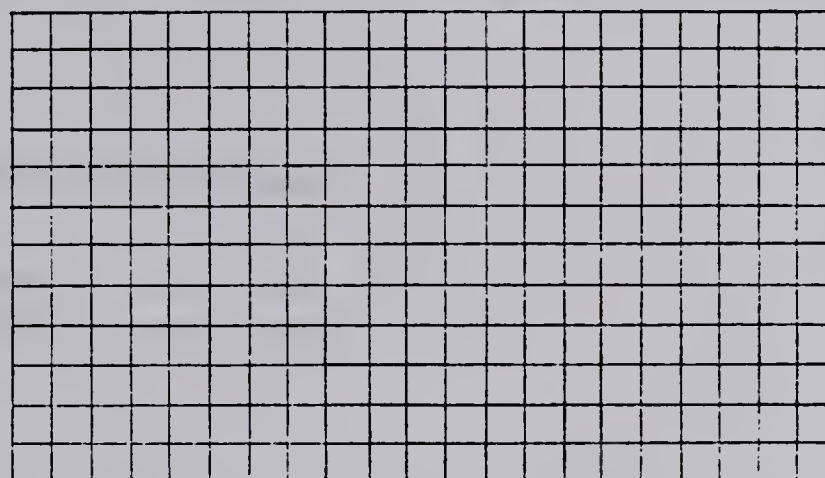
# GEOMETRY

## OBJECTIVE 2

Constructs 2-dimensional figures using straws, pipecleaners, wires, geoboard, etc.

## TEST ITEMS

19. On the grid paper below draw a square, a rectangle, and a triangle.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:4 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	11.56	11.93	0.16	0.39	20.24	17.73	68.04	69.94
MEAN (%)	7.01	6.79	50.00	50.00	66.71	67.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HC:	PRCOPR78=	PROPOR79	#	SS		DF			
	I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FREQ
A:	-0.355	3720	0.722	#	5.45	77503.44	1	435	0.031	0.861
B:	-1.354	3720	0.176	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	1.947	3720	0.052	#	15.21	1837.72	1	706	5.843	0.016
D:	-1.253	3720	0.211	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	F-CR
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	82.54	81.99	#	182.16	2433749.42	1	2438	0.182	0.669
LATE	83.12	84.87	#	928.19	993723.32	1	1204	1.125	0.289
MALE	80.62	81.67	#	526.60	2000288.09	1	1920	0.505	0.477
FEMALE	84.38	84.06	#	45.37	1537198.11	1	1798	0.053	0.818
NORTH	80.20	75.79	#	4778.54	1137563.64	1	981	4.121	0.043
SOUTH	83.26	85.28	#	2793.03	2374477.92	1	2737	3.219	0.073
PUBLIC	83.58	81.52	#	3105.16	2899366.71	1	2941	3.150	0.076
SEPARATE	78.18	87.84	#	18177.64	626278.22	1	777	22.552	0.000

FIGURE 78











the Zone One pupils in 1978 and 1979 were at the 85-100 percent category.

### Hypothesis 2

None of the objectives had significant increases in the proportion of pupils achieving to the 85-100 percent level in 1979 over 1978.

### Findings

Pupils had no difficulty classifying and identifying 2-dimensional figures and 3-dimensional objects. About eighty-seven percent of the pupils were in category D (85-100 percent) for both 1978 and 1979.

About seven in ten pupils could construct the square, rectangle and triangle with 100 percent accuracy. The construction of the 3-dimensional cube and sphere items involved the actual use of plasticine. Slightly over fifty percent of the grade three pupils could successfully construct both the cube and the sphere. About one-third of the pupils could make only one or the other.

Only about one-third of the pupils could recognize corresponding parts in polygons to the 100 percent level. A slightly larger group scored zero on this objective. The mean scores of most of the sub-groups were at the 50 percent level.

GRAPHING (Four objectives; Figures 81 to 84)

### Hypothesis 1

None of the objectives had performances where eighty



percent of the Zone One pupils in 1978 and 1979 were at the 85-100 achievement level.

### Hypothesis 2

Three objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

Almost sixty percent of the pupils in 1979 could identify the axes lines to the 100 percent level. That represented a twelve percent increase in the 100 percent group from 1978. All Zone One sub-groups had significant mean score increases for 1979, still, from one-half in 1978 to one-third of the pupils in 1979 could not identify the axes.

Significantly more pupils in 1979 could construct simple bar, line and pictographs than in 1978. Still only thirty-six percent could do so. Although all sub-groups mean scores increased, about forty percent of the Zone One pupils achieved at or below the 64 percent level.

Slightly better than 7 in 10 pupils could accurately locate the position of objects on a grid using co-ordinates. All sub-group means were over the 80 percent level. Three quarters of the pupils could plot points on a grid when given two coordinates in at least three out of the four examples.



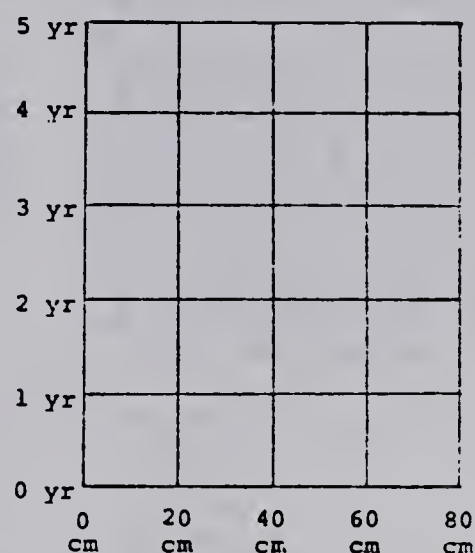
### LEVEL C (Grade 3)

## GRAPHING

**OBJECTIVE 1** *Identifies the axes.*

## TEST ITEMS

6. On the grid at the right, trace over the lines that are the axes. Use a red crayon.



## ANALYSIS

-ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:5 OBJECTIVE:1

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	50.31	37.24	3.24	3.87	0.0	0.0	46.44	58.50
MEAN (%)	0.0	0.0	50.00	50.00	*****	*****	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST			
HO: PRCPOR78=PRCPOR79	#	SS	DF				
T-CALC	DF	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN
A: 8.034	3720	0.000	#	SSW IS EQUAL TO ZERO			
B: -1.030	3720	0.303	#	SSW IS EQUAL TO ZERO			
C: 0.0	3720	1.000	#	TOO FEW PUPILS FOR CALCULATIONS			
D: -7.603	3720	0.000	#	SSW IS EQUAL TO ZERO			

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	48.46	60.49	#	88075.50	5745521.83	1	2438	37.373	0.000
LATE	47.27	60.19	#	50289.82	2857232.98	1	1204	21.191	0.000
MALE	48.38	58.64	#	50471.02	4575383.56	1	1920	21.179	0.000
FEMALE	47.72	63.15	#	107109.65	4170777.85	1	1758	46.174	0.000
NORTH	53.10	59.96	#	11524.05	2291237.90	1	981	4.934	0.027
SOUTH	46.20	61.13	#	152543.38	6445957.90	1	2737	64.771	0.000
PUBLIC	50.96	60.56	#	67707.88	6958659.78	1	2941	28.616	0.000
SEPARATE	37.25	61.87	#	117827.41	1736543.58	1	777	52.721	0.000

FIGURE 81



# LEVEL C (Grade 3)

## GRAPHING

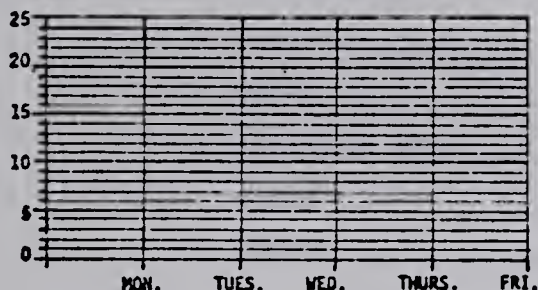
### OBJECTIVE 2

Collects data and constructs simple bar, line and pictographs.

### TEST ITEMS

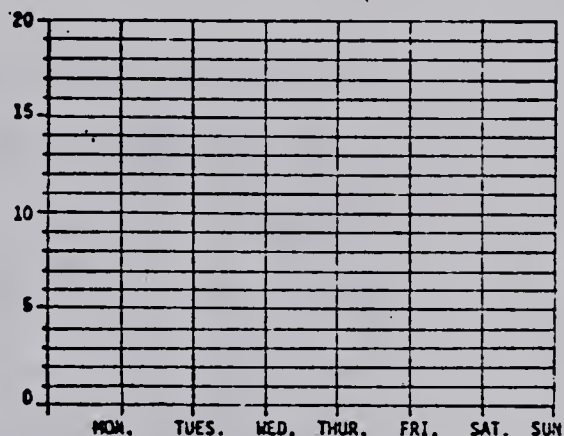
8. Read the story and draw the graph.

Story: Every day last week, Jill did an adding quiz. Here's how she scored. Draw a bar graph to show this information.



Mon. - 20 right  
Tues. - 15 right  
Wed. - 10 right  
Thurs. - 16 right  
Fri. - 20 right

10. Make a line graph showing the temperatures for the week.



Mon. 4° C  
Tues. 7° C  
Wed. 1° C  
Thurs. 6° C  
Fri. 8° C  
Sat. 14° C  
Sun. 12° C

9. Read the story and draw the graph.

Story: The Easter bunny left 5 eggs in Jane's basket, 2 eggs in Bill's basket, 3 eggs in Tom's basket, and no eggs in Jill's basket. Draw a picturegraph that would show the number of eggs each child got from the bunny.

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:5 OBJECTIVE: 2

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	37.24	28.45	10.77	10.83	25.05	24.14	26.54	36.57
MEAN (%)	20.27	21.38	55.10	55.95	70.96	70.71	98.16	97.46

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HC: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	5.699	3720	0.000	#	364.15	293287.15	1	1225	1.521 0.218
B:	-0.054	3720	0.957	#	73.47	6175.84	1	400	4.759 0.030
C:	0.643	3720	0.520	#	14.79	41860.13	1	914	0.323 0.570
D:	-6.321	3720	0.000	#	141.18	15911.64	1	1175	10.425 0.001

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	58.61	64.72	#	22742.61	2613653.08	1	2438	21.214	0.000
LATE	56.36	64.03	#	17686.73	1295601.00	1	1204	16.436	0.000
MALE	56.48	62.98	#	20291.07	2132012.66	1	1920	18.273	0.000
FEMALE	59.01	66.85	#	27613.34	1849131.11	1	1798	26.850	0.000
NORTH	63.05	57.71	#	6991.12	990217.82	1	981	6.926	0.009
SOUTH	55.72	67.34	#	92396.67	2948358.06	1	2737	85.773	0.000
PUBLIC	58.00	64.97	#	35769.82	3267855.21	1	2941	32.192	0.000
SEPARATE	56.60	64.42	#	11897.68	722384.17	1	777	12.797	0.000

FIGURE 82



# LEVEL C (Grade 3)

## GRAPHING

**OBJECTIVE 3** *Locates position of an object on a grid.*

### TEST ITEMS

4. Study the grid. Give the co-ordinates.

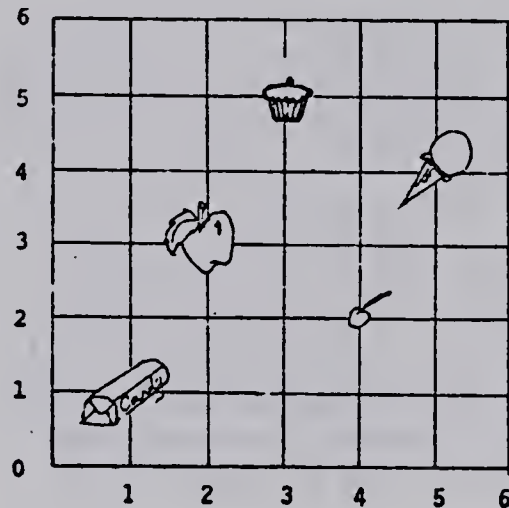
cupcake 3,5

apple 2,3

ice cream cone 5,4

candy 1,1

cherry 4,2



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND:5 OBJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	19.77	16.08	7.27	8.29	1.36	2.21	71.60	73.43
MEAN (%)	19.37	19.04	59.78	59.80	78.46	80.00	99.99	99.99

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HC: PRCPOR78=PRCPOR79				SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.932	3720	0.003	#	17.61	163978.20	1	667	0.072	0.789
B:	-1.159	3720	0.247	#	0.02	587.53	1	287	0.009	0.925
C:	-1.964	3720	0.050	#	37.30	338.46	1	64	7.052	0.010
D:	-1.246	3720	0.213	#	0.00	199.85	1	2696	0.000	0.983

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	80.39	82.59	#	2961.18	2581631.90	1	2438	2.796	0.095
LATE	82.27	84.61	#	1648.24	1126613.12	1	1204	1.761	0.185
MALE	79.36	83.02	#	6400.49	2035126.88	1	1920	6.038	0.014
FEMALE	82.42	83.41	#	437.95	1773224.05	1	1798	0.444	0.505
NORTH	82.34	80.88	#	527.57	1002402.64	1	981	0.516	0.473
SOUTH	80.28	84.01	#	9543.90	2805458.80	1	2737	9.311	0.002
PUBLIC	81.43	83.74	#	3922.94	2976510.70	1	2941	3.876	0.049
SEPARATE	78.61	81.15	#	1247.61	831830.70	1	777	1.165	0.281

FIGURE 83



### LEVEL C (Grade 3)

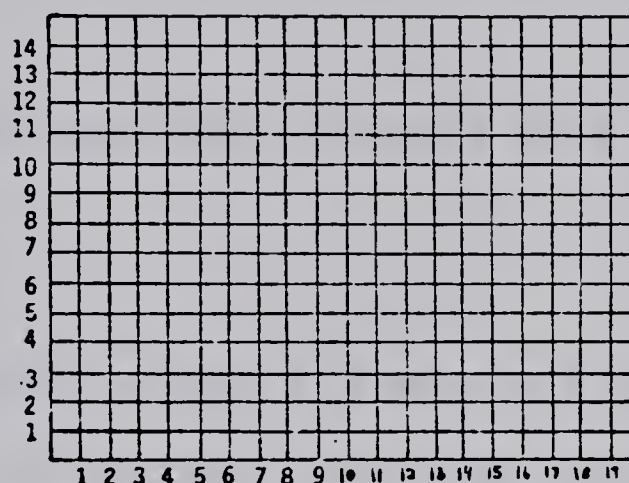
## GRAPHING

**OBJECTIVE 4** Plots points on a grid when given the two co-ordinates.

## TEST ITEMS

5. Do these questions on the grid below:

1. Draw a red dot on (9, 13).
2. Draw a blue dot on (5, 2).
3. Draw a black dot on (18, 4).
4. Draw a green dot on (13, 9).



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND:5 OBJECTIVE: 4

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	22.96	17.68	6.38	6.35	15.43	12.76	55.23	63.20
MEAN (%)	6.95	7.34	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HC:	PROPOR78=	PROPOR79	#	SS		DF			
	I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CRIT
A:	3.996	3720	0.000	#	29.05	96551.98	1	757	0.228	0.633
B:	0.034	3720	0.973	#	<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>			
C:	2.334	3720	0.020	#	<<<<<<<<<<<<	SSW IS EQUAL TC ZERO	>>>>>>>>>>>>			
D:	-4.946	3720	0.000	#	<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>			

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	71.17	75.66	#	12271.97	3384047.45	1	2438	8.841	0.003
LATE	72.63	79.97	#	16214.71	1596476.53	1	1204	12.228	0.001
MALE	69.80	77.09	#	25542.56	2702879.66	1	1920	18.144	0.000
FEMALE	73.51	77.42	#	6881.15	2376556.35	1	1798	5.206	0.023
NORTH	76.21	78.16	#	929.48	1188334.25	1	981	0.767	0.381
SOUTH	69.88	76.94	#	34095.79	3882095.79	1	2737	24.039	0.000
PUBLIC	73.16	78.19	#	18591.40	3887807.68	1	2941	14.064	0.000
SEPARATE	68.72	73.67	#	12288.06	1174525.17	1	777	8.129	0.005

FIGURE 84



## A. DISCUSSION OF THE GRADE THREE RESULTS

The combined achievement means for grade three pupils, given by objective and strand in Table 11, are similar for 1978 and 1979. The achievement means for individual objectives vary greatly with each strand showing both high and low performances.

Discussion specific to the individual strands will follow.

### Number

Achievement within the number strand was very similar for 1978 and 1979, however the 15 percent drop from grade two for both years is rather dramatic. One explanation may be that the difficulties that emerged at the grade one and two levels on place value related skills appear to be compounding. The introduction of decimals to tenths could complicate the achievement picture although most pupils did reasonably well at reading and writing such numerals (Figure 57).

The success that many grade three pupils appear to have with identifying, writing and comparing fractions is encouraging. The content in the common fraction objective (Figure 58) represents a cutback from previous elementary mathematics programs and seems to be more in line with what the majority of children can handle.

This also holds for the 'order' and 'betweenness' concepts in conjunction with the inequalities ( $<$ ,  $>$ ) and the equals ( $=$ ) symbols. This terminology was also introduced



TABLE 11  
PERCENTAGE MEANS FOR GRADE THREE STUDENTS IN ZONE  
ONE FOR 1978 AND 1979

ZONE ONE		GRADE THREE				JUNE/78			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	86.6%	1	70.8%	1	83.9%	1	92.0%	1	48.1%
2	69.7%	2	74.0%	2	47.5%	2	82.4%	2	57.7%
3	73.4%	3	84.4%	3	83.3%	3	70.8%	3	80.8%
4	45.4%	4	69.3%	4	71.7%	4	48.7%	4	71.6%
5	75.6%	5	78.2%	5	41.2%				
6	66.9%	6	72.0%	6	73.1%				
7	73.5%	7	68.2%	7	57.0%				
		8	82.9%	8	90.6%				
		9	56.0%	9	38.2%				
-----									
AVG	70.1%		72.9%		67.4%		74.5%		64.5%

ZONE ONE		GRADE THREE				JUNE/79			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	86.4%	1	66.5%	1	84.4%	1	92.0%	1	60.8%
2	71.2%	2	72.2%	2	77.0%	2	82.8%	2	64.9%
3	73.8%	3	84.7%	3	81.6%	3	70.4%	3	83.2%
4	47.8%	4	69.1%	4	72.3%	4	49.5%	4	77.3%
5	75.3%	5	61.8%	5	41.0%				
6	74.1%	6	70.8%	6	73.5%				
7	75.7%	7	66.9%	7	56.0%				
		8	83.5%	8	90.1%				
		9	54.7%	9	43.1%				
-----									
AVG	71.9%		72.5%		68.8%		73.7%		71.5%

earlier in the former Alberta programs with little success.

Figure 52 indicates that eighty percent of the pupils now achieve within categories C and D.



TABLE 12

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	19.25	15.86	16.37	16.96	31.54	32.76	32.85	34.42
MEAN (%)	35.04	35.61	57.58	57.66	74.61	74.45	92.69	93.15

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	2.715	3720	0.007	51.60	87134.81	1	653	0.387	0.534
B:	-0.484	3720	0.629	0.92	10680.55	1	618	0.053	0.617
C:	-0.800	3720	0.424	4.21	39008.39	1	1154	0.129	0.720
D:	-1.016	3720	0.310	67.27	27260.01	1	1249	3.082	0.079

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	12.29	10.44	15.12	17.85	41.06	44.14	31.54	27.57
MEAN (%)	36.19	34.51	58.44	58.25	75.22	75.62	91.02	90.95

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	1.774	3720	0.076	294.98	66589.96	1	422	1.869	0.172
B:	-2.246	3720	0.025	5.25	9803.23	1	610	0.327	0.568
C:	-1.904	3720	0.057	64.65	47154.07	1	1562	2.169	0.141
D:	2.651	3720	0.008	0.28	19436.77	1	1100	0.016	0.900

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:3 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.53	16.24	24.16	19.78	38.28	39.67	21.03	24.31
MEAN (%)	33.53	32.51	57.85	57.55	74.88	75.04	91.29	91.88

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	0.234	3720	0.815	155.60	129965.40	1	608	0.728	0.394
B:	3.226	3720	0.001	18.48	16707.13	1	818	0.905	0.342
C:	-0.865	3720	0.387	9.46	44256.33	1	1448	0.309	0.578
D:	-2.394	3720	0.017	74.91	18041.60	1	840	3.488	0.062



TABLE 13

## ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES

## A-D FOR THE GEOMETRY AND GRAPHING STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND: GEOMETRY

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	9.10	10.17	22.59	20.28	29.50	29.89	38.81	39.67
MEAN (%)	29.74	27.66	57.56	57.80	73.82	74.30	92.77	93.14

## TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: PROPOR78=PROPOR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	-1.102	3720	0.271	#	388.45	72471.43	1	355	1.908 0.168
B:	1.721	3720	0.086	#	11.44	23507.67	1	757	0.388 0.534
C:	-0.261	3720	0.794	#	63.70	17732.42	1	1103	3.962 0.047
D:	-0.538	3720	0.591	#	48.81	51757.32	1	1458	1.375 0.241

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:3 STRAND: GRAPHING

TOTAL NUMBER OF PUPILS: 1978 N=1912 1979 N=1810

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	26.83	19.12	17.83	13.26	24.90	25.86	30.44	41.77
MEAN (%)	27.32	27.90	56.23	56.86	73.89	73.86	94.60	94.72

## TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: PROPOR78=PROPOR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	5.583	3720	0.000	#	70.03	197263.68	1	857	0.304 0.581
B:	3.844	3720	0.000	#	56.06	9308.25	1	579	3.487 0.062
C:	-0.673	3720	0.501	#	0.12	37721.99	1	942	0.003 0.956
D:	-7.199	3720	0.000	#	4.99	32710.98	1	1336	0.204 0.652



### Operations and Properties

Although this strand appears heavy at the grade three level, pupil achievement is good for the majority of objectives. However level three pupils still appear to confuse the four operations. Only about sixty percent of the group could recognize additive, subtractive, multiplicative and divisive situations with any degree of accuracy. Reading ability, the often cited weakness, was not the cause since teachers read the mathematics stories out loud. The data from the items where pupils were required to identify related sentences and solve word problems (Figures 66 and 67), supports to the idea that better understanding of the operations is required.

Since only about one-third of the pupils mastered the basic facts involving sums, minuends, products and dividends to 18, one might expect some problems with the algorithms. This was not the case however as pupils were able to add and subtract two and three digit numbers with more success than the one digit facts. One explanation may be that pupils spend a fair amount of time in the operations without a commitment of the basic facts to memory.

### Measurement

The difficulties that pupils have had with money became more evident at the grade three level. The weakness appears to be more on making change and not so much on the actual counting of coin collections. Perhaps the demands made of pupils in these items are similar to those in problem



solving. In fact the two items used to measure the 'making purchase and change' skills involve a sequence of operations; subtraction first then addition.

The significant increase in the 1979 performance on reciting the months of the year in order may be an indication that this topic received little emphasis previously.

It is not clear from the analysis in Figure 74 whether the difficulties pupils are having are with the estimation or the measurement skills. The weakness is more than likely with the estimating of lengths.

Although grade three children improved from 1978 to 1979 at expressing linear measurement to tenths the large proportion of zero scores may indicate that the decimal aspect of metric measurement is not emphasized. Decimal conversion from the common fraction could be the alternative that teachers use.

### Geometry

The requirement in the grade three objectives of classifying or identifying 2-dimensional figures and 3-dimensional objects are similar to those for grade two. The items at the grade three level however appear easier than the one for grade two. This likely distorts the achievement picture somewhat.

The objective on recognizing corresponding parts in polygon's does not stipulate whether the polygons are to be transformed in any way. Achievement on the item in Figure 80



would likely be different had the polygons not been rotated.

### Graphing

It is interesting to note that the greatest 1979 gains were made on the Graphing strand. Apparently more time has been devoted to the concept of ordered pairs and the quadrant.

Suprisingly many pupils have problems in constructing a graph even given the data. Students may lack the experience of translating the numeric informatin to graphic form.



## CHAPTER VII

### GRADE FOUR

#### ANALYSIS OF OBJECTIVES ONE AND TWO FOR GRADE FOUR

NUMBER (Nine objectives; Figures 87 to 95)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were within the 85-100 percent category.

##### Hypothesis 2

Eight objectives had significant increases in the proportion of students achieving to the 85-100 percent level in 1979 over 1978.

##### Findings

Five of the number objectives relate to place value skills; three of these involve decimals to hundredths and all five report rather low achievement ratings.

Although ten percent more pupils in 1979 than in 1978 could identify and use the place value of digits (Figure 87), still about four pupils in ten could not do so. The same proportion of students had similar achievement figures for reading and writing decimals to hundredths.

Most pupils (eighty-four percent) failed to correctly answer any of the items involving regrouping numbers to tenths and hundredths. Forty-three percent of the pupils could not regroup 5-digit whole numbers nor rewrite them in



- PART I -

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
I	1	Number	1	10
I	2	Number	1	14
I	3	Number	2	10
I	4	Number	2	10
I	5	Number	3	10
I	6	Number	3	10
I	7	Number	4	15
I	8	Number	5	15
I	9	Number	6	4
I	10	Number	6	4
I	11	Number	6	4
I	12	Number	7	12
I	13	Number	8	12
I	14	Number	9	10

- PART II -

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
II	15	Op. & Prop.	1	8
II	16	Op. & Prop.	2	4
II	17	Op. & Prop.	2	4
II	18	Op. & Prop.	3	9
II	19	Op. & Prop.	4	10
II	20	Op. & Prop.	5	10
II	21	Op. & Prop.	6	9
II	22	Op. & Prop.	6	9
II	23	Op. & Prop.	7	6
II	24	Op. & Prop.	7	6
II	25	Op. & Prop.	8	8
II	26	Op. & Prop.	9	4
II	27	Op. & Prop.	9	5
II	28	Op. & Prop.	10	8

FIGURE 85  
GRADE FOUR DETAILED ANALYSIS OF MARK WEIGHTINGS



- PART III -

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
III	1	Measurement	1	5
III	2	Measurement	2	5
III	3	Measurement	3	18
III	4	Measurement	4	8
III	5	Measurement	5	8
III	6	Measurement	6	6
III	7	Measurement	7	4
III	8	Measurement	7	2
III	9	Measurement	8	4
III	10	Measurement	8	4
III	11	Measurement	9	8

- PART IV -

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
IV	12	Geometry	1	14
IV	13	Geometry	2	20
IV	14	Geometry	3	6
IV	15	Geometry	3	4
IV	16	Geometry	3	4
IV	17	Graphing	1	5
IV	18	Graphing	1	5
IV	19	Graphing	1	5
IV	20	Graphing	2	8
IV	21	Graphing	2	10
IV	22	Graphing	3	3
IV	23	Graphing	4	4

FIGURE 86  
GRADE FOUR DETAILED ANALYSIS OF MARK WEIGHTINGS



## LEVEL D (Grade 4)

### NUMBER

**OBJECTIVE 1** *Identifies and uses place value of digits (0.01 - 99 000).*

### TEST ITEMS

1. Write the following numbers containing:

- |   |  |
|---|--|
| <p>(a) 4 hundreds<br/>2 tens<br/>0 ones<br/>5 tenths</p> <p>_____</p> | <p>(b) 6 hundreds<br/>2 tens<br/>5 ones<br/>6 tenths<br/>1 hundredths</p> <p>_____</p> |
|---|--|

2. For the number, 75 896.01, show:

- How many in the thousands place? \_\_\_\_\_
- How many in the ones place? \_\_\_\_\_
- How many in the ten thousands place? \_\_\_\_\_
- How many in the tenths place? \_\_\_\_\_
- How many in the tens place? \_\_\_\_\_
- How many in the hundreds place? \_\_\_\_\_
- How many in the hundredths place? \_\_\_\_\_

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 1  
 TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	51.96	39.56	10.97	11.99	10.21	10.82	26.86	37.63
MEAN (%)	14.77	15.57	56.43	56.27	77.24	78.15	99.21	99.23

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HC: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	7.944	4082	0.000	#	291.15	429818.98	1	1876	1.271 0.260
B:	-1.019	4082	0.308	#	3.07	8898.69	1	466	0.161 0.689
C:	-0.630	4082	0.529	#	89.16	12830.02	1	427	2.967 0.086
D:	-7.375	4082	0.000	#	0.15	7728.05	1	1307	0.026 0.872

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
=====	1978	1979	#						
EARLY	45.77	57.13	#	87241.97	4076031.23	1	2710	58.004	0.000
LATE	53.48	63.53	#	32580.64	1862516.05	1	1268	22.531	0.000
MALE	48.36	57.62	#	45845.45	3198887.44	1	2139	30.655	0.000
FEMALE	48.43	59.93	#	64071.44	2905716.20	1	1941	42.740	0.000
NORTH	42.69	50.33	#	21029.22	2118395.74	1	1446	14.354	0.000
SOUTH	51.69	63.05	#	84898.82	3881476.39	1	2634	57.613	0.000
PUBLIC	48.32	59.28	#	99141.19	4950641.55	1	3305	66.186	0.000
SEPARATE	48.73	56.33	#	11200.76	1157832.56	1	775	7.497	0.006

FIGURE 87



# LEVEL D (Grade 4)

## NUMBER

OBJECTIVE 2 Regroups 5-digit whole numbers and rewrites in expanded notation.

## TEST ITEMS

3. Fill in the blanks:

$$65\ 957 = 6 \times \underline{\hspace{2cm}} + 5 \times \underline{\hspace{2cm}} + 9 \times \underline{\hspace{2cm}} \\ + \underline{\hspace{2cm}} \times 10 + \underline{\hspace{2cm}} \times 1$$

4. Fill in the blanks:

$$19\ 048 = \underline{\hspace{2cm}} \times 10\ 000 + \underline{\hspace{2cm}} \times 1\ 000 \\ + \underline{\hspace{2cm}} \times 100 + 4 \times \underline{\hspace{2cm}} + \underline{\hspace{2cm}} \times 1$$

## ANALYSIS

### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 2

TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	53.90	43.47	12.25	11.12	9.83	10.92	24.02	34.46
MEAN (%)	11.50	13.10	56.78	56.26	73.70	75.05	96.92	97.53

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROP
A:	6.661	4082	0.000	1247.28	477035.14	1	1994	5.214	0.023
B:	1.116	4082	0.265	32.13	10662.69	1	476	1.434	0.232
C:	-1.137	4082	0.256	191.14	10299.05	1	421	7.813	0.005
D:	-7.360	4082	0.000	106.89	23396.99	1	1185	5.413	0.020

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROP
=====	1978	1979	#						
EARLY	42.27	51.20	#	54671.31	4104004.64	1	2710	36.101	0.000
LATE	46.52	58.70	#	47827.44	1932166.44	1	1288	31.882	0.000
MALE	42.71	51.66	#	42787.16	3190384.44	1	2139	26.687	0.000
FEMALE	44.72	56.19	#	63823.20	2985203.92	1	1941	41.498	0.000
NORTH	36.81	43.95	#	18322.53	2112778.84	1	1446	12.540	0.000
SOUTH	47.65	58.89	#	83115.52	3918457.51	1	2624	55.871	0.000
PUBLIC	44.52	53.72	#	69882.65	5055584.99	1	3305	45.685	0.000
SEPARATE	39.99	54.02	#	38225.67	1125650.84	1	775	26.318	0.000

FIGURE 88



# LEVEL D (Grade 4)

## NUMBER

OBJECTIVE 3 Rounds whole numbers (limit: 3-digit accuracy).

## TEST ITEMS

5. Round to the nearest thousand (1 000).

- a. 1 459 \_\_\_\_\_
- b. 39 102 \_\_\_\_\_
- c. 89 927 \_\_\_\_\_
- d. 9 999 \_\_\_\_\_
- e. 999 \_\_\_\_\_

6. Round to the nearest dollar.

- a. \$101.49 \$ \_\_\_\_\_
- b. \$349.16 \$ \_\_\_\_\_
- c. \$ 7.51 \$ \_\_\_\_\_
- d. \$ 99.81 \$ \_\_\_\_\_
- e. \$ .75 \$ \_\_\_\_\_

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 3  
 TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	53.81	45.15	15.84	16.56	13.43	16.86	16.93	21.43
MEAN (%)	16.04	17.75	54.60	54.69	74.58	74.71	96.37	96.48

### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES CONTAINING 1970 AND 1975 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HC: PROPOR78=PROPOR79				SS		DF			
	T-CALC	DF	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	5.529	4082	0.000	1457.69	458041.62	1	2025	6.444	0.011
B:	-0.622	4082	0.534	1.53	16439.92	1	659	0.061	0.804
C:	-3.064	4082	0.002	2.85	15247.11	1	614	0.115	0.735
D:	-3.660	4082	0.000	2.44	17878.68	1	778	0.106	0.744

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	42.12	48.36	#	26254.56	3116407.82	1	2710	22.831	0.000
LATE	46.53	54.79	#	22011.44	1458065.23	1	1288	18.925	0.000
MALE	46.20	51.49	#	14971.95	2495707.78	1	2139	12.832	0.000
FEMALE	40.83	49.04	#	32675.46	2214002.23	1	1941	28.646	0.000
NORTH	38.83	40.76	#	1344.50	1704095.01	1	1446	1.141	0.286
SOUTH	46.37	55.32	#	52827.94	2901826.03	1	2634	47.952	0.000
PUBLIC	44.13	51.05	#	39506.34	3916202.33	1	3305	33.341	0.000
SEPARATE	41.28	47.45	#	7393.17	805022.08	1	775	7.117	0.008

FIGURE 89



LEVEL D (Grade 4)

NUMBER

OBJECTIVE 4

Identifies, reads and writes a fraction to represent a point on a number line or a region with emphasis on halves, quarters, fifths and tenths.

TEST ITEMS

7. Colour in two fifths of the box below.

Write the fractional number for the space that you did not colour in.

\_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	11.21	8.89	27.75	26.00	0.09	0.10	60.95	65.01
MEAN (%)	6.81	9.94	53.33	53.35	70.00	66.67	99.97	99.97

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
A:	2.458	4082	0.014	989.73	118783.63	1	410	3.416	0.065
B:	1.261	4082	0.208	0.05	44.36	1	1097	1.147	0.285
C:	-0.072	4082	0.943	11.11	22.22	1	2	1.000	0.423
D:	-2.685	4082	0.007	0.02	753.44	1	2567	0.064	0.801

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS									
				F-TEST TABLE					
GROUPS		YEARS		SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROP
EARLY	74.54	78.90	#	12802.49	2889585.57	1	2710	12.007	0.001
LATE	81.08	81.87	#	201.93	1053755.17	1	1288	0.247	0.619
MALE	75.36	77.84	#	3304.28	2203666.54	1	2139	3.207	0.074
FEMALE	77.85	82.05	#	8550.12	1813843.80	1	1941	9.150	0.003
NORTH	71.11	73.53	#	2105.09	1698200.74	1	1446	1.792	0.181
SOUTH	79.71	83.07	#	7435.76	2254643.67	1	2634	8.687	0.003
PUBLIC	78.54	80.27	#	2474.43	3096128.43	1	3305	2.641	0.105
SEPARATE	67.83	77.91	#	19752.30	894968.62	1	775	17.104	0.000

FIGURE 90



LEVEL D (Grade 4)

NUMBER

OBJECTIVE 5 Identifies equivalence. Generates equivalent fractions for halves, quarters, fifths, tenths and hundredths.

TEST ITEMS

8. Make three equivalent fractions for each given fraction below:

- A. 1/2
- B. 2/4
- C. 3/10
- D. 2/5
- E. 5/100

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:1 CEJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	65.58	56.37	4.26	5.38	7.71	10.16	22.46	28.05
MEAN (X)	11.87	13.68	56.89	57.23	75.09	74.87	96.52	96.75

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	6.031	4082	0.000	#	2005.52	657486.35	1	2455	7.610 0.006
B:	-1.685	4082	0.052	#	5.75	2139.37	1	194	0.522 0.471
C:	-2.750	4082	0.006	#	4.56	11158.95	1	361	0.148 0.701
D:	-4.140	4082	0.000	#	13.02	27408.51	1	1026	0.487 0.485

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	35.41	42.24	#	31548.79	4093377.01	1	2710	20.887	0.000
LATE	42.18	51.38	#	27288.05	2019980.99	1	1288	17.400	0.000
MALE	37.35	43.49	#	20164.89	3266103.38	1	2139	13.206	0.000
FEMALE	38.02	47.93	#	47637.59	3015258.73	1	1941	30.666	0.000
NORTH	31.99	31.35	#	147.19	2050007.26	1	1446	0.104	0.747
SOUTH	40.96	52.95	#	94747.96	3995251.08	1	2634	62.466	0.000
PUBLIC	39.01	43.78	#	18788.18	5096062.55	1	3305	12.185	0.001
SEPARATE	31.78	52.90	#	86640.82	1152764.52	1	775	58.248	0.000

FIGURE 91



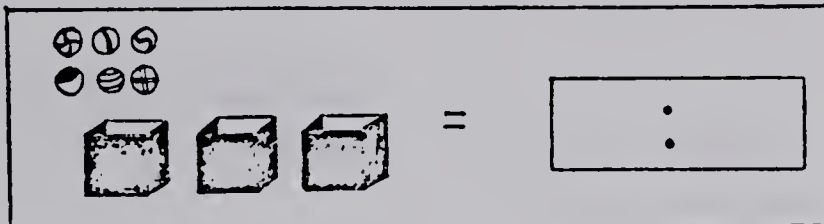
## LEVEL D (Grade 4)

## NUMBER

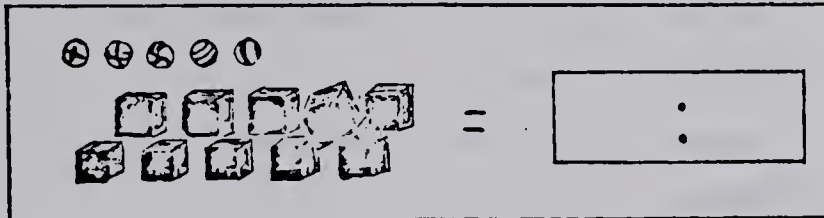
**OBJECTIVE 6**     *Interprets simple ratio situations.*

## TEST ITEMS

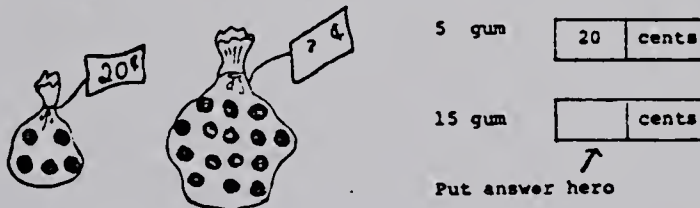
10. Use numbers to show the ratio of marbles to blocks for each picture below:



11.



9. Fill in the amount of money needed for 15 gum.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

-----  
CRITERION CATEGORIES FOR      GRADE:4      STRAND:1      DEJECTIVE: 6

**TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1565**

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	40.52	36.47	0.28	0.86	28.32	29.61	30.87	33.06
MEAN (%)	16.74	19.12	50.00	50.00	66.90	66.77	100.00	99.97

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HC:	PRCPOR78=	PROPOR79	#	SS		DF			
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	2.660	4082	0.008	#	2196.54	428536.00	1	1573	8.063	0.005
B:	-2.474	4082	0.013	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	-0.907	4082	0.365	#	5.50	3155.10	1	1180	2.057	0.152
D:	-1.499	4082	0.134	#	0.21	138.46	1	1302	2.009	0.157

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS.

		F-TEST TABLE							
GROUPS	YEARS		#	SS		DF		E-RATIO	F-CR
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	55.70	57.88	#	3222.07	3564202.31	1	2710	2.450	0.118
LATE	58.05	65.61	#	18433.07	1644780.54	1	1288	14.435	0.000
MALE	56.53	59.24	#	3939.18	2836972.88	1	2139	2.968	0.085
FEMALE	56.99	61.35	#	9202.33	2514372.25	1	1941	7.104	0.008
NORTH	54.47	49.47	#	9025.13	1957705.18	1	1446	6.666	0.010
SOUTH	58.07	65.81	#	39524.74	3273261.89	1	2634	31.806	0.000
PUBLIC	57.16	60.19	#	7564.59	4291838.69	1	3305	5.825	0.016
SEPARATE	54.94	60.38	#	5747.68	1062219.58	1	775	4.194	0.041

FIGURE 92



## LEVEL D (Grade 4)

## NUMBER

OBJECTIVE 7 Reads and writes decimals to hundredths.

## TEST ITEMS

12. Fill in the blanks:

A. 47 hundredths = \_\_\_\_\_ tenths +  
hundredths

B. 52 hundredths = \_\_\_\_\_ tenths +  
\_\_\_\_\_ hundredths

C. 7 hundredths = \_\_\_\_\_ tenths +  
hundredths

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	51.73	42.51	2.17	2.03	17.02	17.93	29.08	37.53
MEAN (%)	13.48	15.51	50.00	50.00	70.88	71.08	100.00	99.97

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HO: PRPOR78=PRPOR79	#	SS	DF						
T-CALC	DE	FRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A: 5.895	4082	0.000	#	1967.11	427392.17	1	1929	8.878	0.003
B: 0.319	4082	0.750	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C: -0.763	4082	0.446	#	7.24	37911.57	1	711	0.136	0.713
D: -5.734	4082	0.000	#	0.38	207.49	1	1352	2.503	0.114

### ----- COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE-SUBGROUPS -----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS	DF		F-RATIO	F-CR	
					BETWEEN	WITHIN			BETWEEN
EARLY	47.36	56.65	#	58363.94	4347402.61	1	2710	36.382	0.000
LATE	53.84	61.04	#	16714.38	2012344.67	1	1288	10.698	0.001
MALE	46.20	54.01	#	32651.69	3382555.84	1	2139	20.648	0.000
FEMALE	52.41	62.27	#	47055.79	3057070.42	1	1941	29.877	0.000
NORTH	43.81	50.28	#	15117.36	2330841.38	1	1446	9.378	0.002
SOUTH	52.32	61.81	#	59362.26	4068217.94	1	2634	38.435	0.000
PUBLIC	50.96	57.60	#	36381.42	5326446.13	1	3305	22.574	0.000
SEPARATE	41.43	58.98	#	59818.67	1137524.93	1	775	40.755	0.000

FIGURE 93



LEVEL D (Grade 4)

NUMBER

OBJECTIVE 8 Regroups tenths and hundredths.

TEST ITEMS

13. Write these numbers:
- A. 6 ones, 8 tenths, 13 hundredths
- B. 2 ones, 12 tenths, 7 hundredths
- C. 5 ones, 11 tenths, 14 hundredths

ANALYSIS

-ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D-									
CRITERION CATEGORIES FOR GRADE:4 STRAND:1 OBJECTIVE: 8									
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969									
	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%		
	1978	1979	1978	1979	1978	1979	1978	1979	
NUMBER (%)	91.06	84.05	0.0	0.56	2.17	3.96	6.76	11.43	
MEAN (%)	1.51	2.25	*****	50.00	66.85	66.99	100.00	100.00	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HC: PRCPOR78=PRCPOR79	#		SS	DF					
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	FFGE
A:	6.813	4082	0.000	#	476.11	205153.18	1	3579	8.306 0.004
B:	-3.442	4082	0.001	#	<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>				
C:	-3.325	4082	0.001	#	0.56	407.14	1	122	0.168 0.682
D:	-5.203	4082	0.000	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>>				
-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----									
F-TEST TABLE									
GROUPS	YEARS	#	SS	DF					
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	FFGE
EARLY	8.80	13.37	#	14152.25	2149698.31	1	2710	17.841	0.000
LATE	10.82	22.28	#	42356.68	1491308.32	1	1288	36.582	0.000
MALE	10.32	14.78	#	10636.81	1919033.25	1	2139	11.856	0.001
FEMALE	8.81	17.92	#	40124.14	1841869.20	1	1941	42.284	0.000
NORTH	6.95	9.68	#	2697.90	865755.14	1	1446	4.506	0.034
SOUTH	11.13	19.66	#	47947.47	2848521.61	1	2634	44.337	0.000
PUBLIC	9.81	16.22	#	33924.62	3096352.57	1	3305	36.211	0.000
SEPARATE	8.65	16.36	#	11550.72	670133.11	1	775	13.358	0.000

FIGURE 94







expanded notation.

Rounding whole numbers, also a place-value skill, was also poorly handled. Although there was a significant increase in the proportion of students working to the 85-100 percent level in 1979, only one student in five was able to achieve this level. Forty-five percent of the grade four sample had achievement scores under 50 percent.

Sixty-five percent of the pupils could identify, read and write a fraction to represent a region to 100 percent accuracy. Another twenty-six percent could correctly answer one of two such items. They did rather poorly, however, when it came to identifying and generating equivalent fractions. Although significantly more pupils could do so in 1979, only twenty-eight percent achieved in category D (85-100 percent) on the equivalent fraction concept. Over half of the students had scores below 50 percent. Sub-group means for fractions ranged from 31 percent for the North Zone to 52 percent for the Separate Schools.

The two objectives involving the interpreting, expressing and generating of ratios also had relatively low performances. Only one pupil in three could reach the 85-100 percent level. About one pupil in two could provide the missing numeral in proportional ratios for at least three of the five examples.

OPERATIONS AND PROPERTIES (Ten Objectives, Figures 96 to 105)



### Hypothesis 1

None of the objectives had performances whereby eighty percent of the Zone One pupils in 1978 and 1979 were within the 85-100 percent level.

### Hypothesis 2

Three objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

Four test items, two addition and two subtraction, were used to determine the achievement of these algorithms. Only one pupil in four answered the rather cumbersome problems with 100 percent accuracy. The same proportion was able to solve one or none of the problems. Pupils actually added and subtracted decimals to hundredths with greater facility (Figure 104). About sixty percent of the pupils performed in categories C and D for decimals as compared with about fifty percent for the algorithms without decimals.

About one-half of the grade four pupils in both years were not able to write related sentences for addition, subtraction, multiplication and division. Only one in five performed in category D.

Fifty percent of the pupils in 1979 could not estimate products and quotient problems (Figure 98). This is about eight percent fewer than in 1978. Only one pupil in five reached the 85-100 percent level for multiplying whole numbers by one and two digit numbers. Fifty-seven percent of



the pupils could, however, correctly answer three or more problems out of five. The remaining forty-three percent of the pupils could do one or fewer of the multiplication questions correctly.

About four pupils in ten could mentally multiply whole numbers by 10, 100 and 1000 to the 85-100 percent level. A similar proportion had mean scores below the 25 percent figure.

Two thirds of the pupils in grade four showed good understanding of the associative property of addition and subtraction. Less than fifteen percent of the Zone group had no understanding of this concept.

Performance for dividing one and two digit whole numbers by one-digit divisors was below that for the other operations. Forty-three percent of the pupils in 1979 failed to demonstrate any knowledge of division. Only one in four of the grade four children achieved within the 85-100 percent category.

About one-third of the students in 1978 and 1979 mastered (85-100 percent) the basic facts for sums and minuends to 18 and products and dividends through 81. The items measuring these skills involved both time and accuracy. Over one-third of the students performed at or below the 64 percent level with these two factors involved.

Test scores on problem solving and estimating answers were very low. Results were very similar for the two years with over fifty percent of the students failing on the











LEVEL D (Grade 4)

OPERATIONS  
AND PROPERTIES

OBJECTIVE 3 Estimates products and quotients.

TEST ITEMS

18. Write what you think should go in each blank space:
- A. To estimate and solve  $7 \times 68$ , we can find the product of  $7 \times$  \_\_\_\_\_ to equal 490.
- B. To estimate and solve  $53 \times 47$ , we can find the product of \_\_\_\_\_  $\times 50$  to equal \_\_\_\_\_.
- C. To estimate and solve  $99 \div 21$ , we can find the quotient of \_\_\_\_\_  $\div$  \_\_\_\_\_ to equal \_\_\_\_\_.
- D. To estimate and solve  $397 \div 103$ , we can find the quotient of \_\_\_\_\_  $\div$  \_\_\_\_\_ to equal \_\_\_\_\_.

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:2 CEJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	60.66	52.67	4.30	4.37	16.03	19.76	19.01	23.21
MEAN (%)	8.12	8.26	55.56	55.56	72.73	72.12	94.91	94.97

TABLES CCMPARING 1978 AND 1979 MEAN SCCRES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PRCPOR78=PRCPOR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PEQE
A:	5.154	4082	0.000	#	10.87	384444.16	1	2318	0.066 0.798
B:	-0.102	4082	0.919	#	0.0	0.00	1	175	0.0 1.000
C:	-3.110	4082	0.002	#	66.96	22377.75	1	726	2.172 0.141
D:	-3.293	4082	0.001	#	0.60	26298.72	1	857	0.019 0.889

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN
EARLY	36.41	41.13	#	15077.41	4096111.23	1	2710	9.975	0.002
LATE	38.44	47.32	#	25410.54	1919972.65	1	1288	17.046	0.000
MALE	36.63	41.83	#	14459.42	3289721.16	1	2139	9.402	0.002
FEMALE	37.43	44.48	#	24068.10	2850977.87	1	1941	16.386	0.000
NORTH	28.59	32.11	#	4472.69	2026357.32	1	1446	3.192	0.074
SOUTH	41.89	48.76	#	31060.71	3908516.42	1	2634	20.932	0.000
PUBLIC	38.57	44.25	#	26636.37	5049266.00	1	3305	17.435	0.000
SEPARATE	30.18	38.23	#	12580.48	1061557.78	1	775	9.184	0.003

FIGURE 98



# OPERATIONS AND PROPERTIES

## LEVEL D (Grade 4)

### OBJECTIVE 4

*Multiplies whole numbers by one  
and two digit whole numbers.*

### TEST ITEMS

19. Find the products and write them in the blanks. Show all of your work for these problems on this page.

A.  $54 \times 4 =$  \_\_\_\_\_

B.  $32 \times 44 =$  \_\_\_\_\_

C.  $821 \times 95 =$  \_\_\_\_\_

D.  $306 \times 62 =$  \_\_\_\_\_

E.  $4 \times 763 =$  \_\_\_\_\_

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE: 4 STRAND: 2 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	46.10	42.97	14.99	17.27	21.37	19.30	17.54	20.47
MEAN (%)	18.43	18.92	60.00	59.97	79.98	79.95	99.97	99.88

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HC: PRCPOR78=PRCPOR79				SS		DF				
I-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FECH	
A:	2.013	4082	0.044	#	110.35	513020.24	1	1819	0.391	0.532
B:	-1.981	4082	0.048	#	0.14	59.71	1	655	0.932	0.335
C:	1.643	4082	0.101	#	0.19	298.73	1	830	0.534	0.465
D:	-2.384	4082	0.017	#	1.82	593.53	1	772	2.370	0.124

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS	#		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FECH
=====	1978	1979	#						
EARLY	50.78	53.07	#	3529.92	3408966.50	1	2710	2.806	0.094
LATE	55.28	57.04	#	1003.34	1483302.48	1	1288	0.871	0.351
MALE	49.97	51.43	#	1138.48	2589552.23	1	2139	0.940	0.332
FEMALE	54.41	57.69	#	5193.93	2378171.69	1	1941	4.239	0.040
NORTH	44.99	44.61	#	54.03	1835295.62	1	1446	0.043	0.837
SOUTH	56.24	59.42	#	6672.65	3002709.55	1	2634	5.853	0.016
PUBLIC	54.52	54.54	#	0.11	3987543.71	1	2305	0.000	0.993
SEPARATE	41.51	53.63	#	28523.60	955532.00	1	775	23.135	0.000

FIGURE 99



# OPERATIONS AND PROPERTIES

## LEVEL D (Grade 4)

OBJECTIVE 5

Divides one and two-digit whole numbers by a one-digit divisor (with and without remainders).

### TEST ITEMS

20. Divide each problem and show remainders. Put your answers in the blanks. Show all of your work for these problems on this page.

A.  $98 \div 9 =$  \_\_\_\_\_ remainder \_\_\_\_\_

B.  $35 \div 7 =$  \_\_\_\_\_ remainder \_\_\_\_\_

C.  $62 \div 8 =$  \_\_\_\_\_ remainder \_\_\_\_\_

D.  $9 \div 4 =$  \_\_\_\_\_ remainder \_\_\_\_\_

E.  $76 \div 6 =$  \_\_\_\_\_ remainder \_\_\_\_\_

### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:2 OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	44.44	43.07	11.68	12.19	16.60	19.25	27.28	25.50
MEAN (%)	12.96	13.82	59.88	59.79	79.83	79.76	99.72	99.82

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
I-CALC	DE	PROB #	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PEGE	
A:	0.886	4082	0.376 #	332.27	490799.05	1	1786	1.209	0.272
B:	-0.503	4082	0.615 #	0.92	785.94	1	485	0.567	0.452
C:	-2.211	4082	0.027 #	0.81	1468.37	1	728	0.400	0.527
D:	1.294	4082	0.196 #	2.58	2439.50	1	1077	1.139	0.286

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PEGE
EARLY	50.58	51.72	#	874.42	4194640.29	1	2710	0.565	0.452
LATE	58.66	58.65	#	0.04	1847579.88	1	1288	0.000	0.996
MALE	51.77	52.66	#	429.93	3270564.46	1	2139	0.281	0.596
FEMALE	54.75	55.61	#	364.87	2929562.25	1	1941	0.242	0.623
NORTH	43.59	44.22	#	144.24	2265043.32	1	1446	0.092	0.762
SOUTH	58.77	59.14	#	92.58	3732217.59	1	2634	0.065	0.798
PUBLIC	55.71	53.22	#	5099.88	4950405.83	1	3305	3.405	0.065
SEPARATE	42.17	57.41	#	45087.02	1194861.50	1	775	29.244	0.000

FIGURE 100



OPERATIONS  
AND PROPERTIES

LEVEL D (Grade 4)

OBJECTIVE 6

Demonstrates mastery of basic facts  
for sums and minuends to 18 and  
products and dividends through 81.

TEST ITEMS

21. Solve each question. You have 1 minute.
22. Solve each question. You have 1 minute.
- A.  $8 + 4 =$

B.  $18 - 9 =$

C.  $5 + 7 =$

D.  $13 - 7 =$

E.  $0 + 6 =$

F.  $12 - 9 =$

G.  $7 + 9 =$

H.  $11 - 6 =$

I.  $8 + 3 =$

J.  $17 - 9 =$

K.  $6 + 8 =$

L.  $12 - 4 =$

M.  $9 + 4 =$

N.  $11 - 0 =$

O.  $15 + 3 =$

P.  $16 - 7 =$

Q.  $6 + 9 =$

R.  $13 - 5 =$

A.  $1 \times 1 =$

B.  $24 \div 1 =$

C.  $0 \div 7 =$

D.  $9 \div 9 =$

E.  $6 \times 9 =$

F.  $27 \div 3 =$

G.  $4 \times 0 =$

H.  $63 \div 7 =$

I.  $4 \times 9 =$

J.  $36 \div 6 =$

K.  $7 \times 7 =$

L.  $48 \div 8 =$

M.  $5 \times 8 =$

N.  $8 \times 9 =$

O.  $42 \div 7 =$

P.  $56 \div 8 =$

Q.  $64 \div 8 =$

R.  $8 \times 4 =$

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:4 STRAND:2 OBJECTIVE: 6  
 TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	23.69	18.94	17.97	18.74	24.59	26.87	33.76	35.45
MEAN (%)	31.51	30.38	56.18	55.63	75.09	74.77	96.16	96.43

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS  
 PROPORTION TEST # F-TEST  
 HC: FRCFOR78=PROPOR79 # SS DF  
 I-CALC DE PROB # BETWEEN WITHIN BETWEEN WITHIN F-RATIO F-CR

A:	3.694	4082	0.000 #	273.25	128370.70	1	872	1.856	0.173
B:	-0.638	4082	0.523 #	57.33	15094.64	1	747	2.837	0.093
C:	-1.667	4082	0.096 #	25.41	40655.96	1	1047	0.654	0.419
D:	-1.135	4082	0.256 #	24.28	26381.75	1	1410	1.298	0.255

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS  
 F-TEST TABLE

GROUPS	YEARS		#	SS		DF		F-RATIO	F-CR
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	67.70	68.57	#	512.49	1846301.38	1	2710	0.752	0.386
LATE	70.02	74.12	#	5422.21	773685.93	1	1288	5.027	0.003
MALE	66.67	67.13	#	111.30	1474468.42	1	2139	0.161	0.688
FEMALE	70.42	74.24	#	7047.00	1176440.51	1	1941	11.627	0.001
NORTH	66.03	67.65	#	945.70	1066689.44	1	1446	1.282	0.258
SOUTH	69.90	71.91	#	2647.53	1601009.05	1	2634	4.356	0.037
PUBLIC	69.48	70.74	#	1298.93	2131385.34	1	3305	2.014	0.156
SEPARATE	64.08	69.29	#	5263.26	541773.78	1	775	7.529	0.006

FIGURE 101



# OPERATIONS AND PROPERTIES

## LEVEL D (Grade 4)

OBJECTIVE 7 Solves word problems. Estimates answers.

### TEST ITEMS

23. Some estimates for the answer to each question are given. Write the closest estimate in the blank.

A. 3 680 pigs. 52 in each pen.  
About how many pens?

About 700? 70? 60? 600? \_\_\_\_\_

B. 78 jelly beans in each jar. 6 jars.  
About how many jelly beans?

About 300? 420? 480? 500? \_\_\_\_\_

C. 28 students in Susan's class. Each drank about 5 glasses of water. About how many drinks did Susan's class take from the fountain in one day?

About 150? 43? 300? 450? \_\_\_\_\_

24. Solve the problems in the space below. Write your answer in the blank.

A. Bill weighs 64 kilograms. Sam weighs 51 kilograms. How much weight must Sam gain to weigh as much as Bill does? \_\_\_\_\_

B. Mr. Jones travelled 1 530 kilometres in 17 hours. How many kilometres per hour did he travel? \_\_\_\_\_

C. Susan's class held a noon hour sandwich sale. They sold 113 peanut butter, 80 ham, and 74 jam sandwiches. How many sandwiches did they sell in the sale? \_\_\_\_\_

### ANALYSIS

#### ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:4 STRAND:2 OBJECTIVE: 7

TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	56.78	57.14	19.95	19.60	19.29	19.81	3.97	3.46
MEAN (%)	21.46	22.52	53.89	53.71	73.33	73.25	96.33	97.55

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 MEANS									
PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
	T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EECB
A:	-0.226	4082	0.821	649.28	507269.09	1	2324	2.975	0.085
B:	0.280	4082	0.780	6.31	13916.18	1	806	0.365	0.546
C:	-0.416	4082	0.678	1.19	39880.46	1	756	0.024	0.877
D:	0.874	4082	0.382	55.90	2418.06	1	150	3.468	0.065

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS	YEARS		#	SS		DF		F-RATIO	ESOR
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	ESOR
EARLY	39.19	39.57	#	97.73	1869294.25	1	2710	0.142	0.707
LATE	44.07	44.80	#	170.85	884157.80	1	1288	0.249	0.618
MALE	40.61	39.86	#	303.26	1464194.97	1	2139	0.443	0.506
FEMALE	41.23	42.88	#	1323.30	1376225.73	1	1941	1.866	0.172
NORTH	37.26	35.82	#	742.65	1085421.22	1	1446	0.989	0.320
SOUTH	43.02	44.10	#	770.24	1712965.29	1	2634	1.184	0.277
PUBLIC	41.58	41.74	#	19.94	2333521.20	1	3305	0.028	0.867
SEPARATE	37.96	39.38	#	391.68	805656.87	1	775	0.600	0.439

FIGURE 102







LEVEL D (Grade 4)

AND PROPERTIES  
OPERATIONS

OBJECTIVE 9 *Adds and subtracts decimals to hundredths.*

TEST ITEMS

26. Solve each decimal problem.

- A. 0.9 - 0.4 =
- B. 4.3 - 0.8 =
- C. 0.51 - 0.33 =
- D. 0.91 - 0.28 =

27. Add:

- A. 2.4

+ 3.6
- B. 1.3

+ 4.8
- C. 7.7

+ 6.7
- D. 7.29

+ 5.80
- E. 7.14

+ 6.95

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:2 OBJECTIVE: 9  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	34.42	26.71	10.26	12.29	21.13	24.38	34.18	36.62
MEAN (%)	16.10	17.13	55.56	55.56	71.86	72.11	95.42	95.65

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HC: FRCPOR78=PROPOR79				SS		DF			
I-CALC		DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO
A:	5.335	4082	0.000	#	323.61	391938.19	1	1252	1.034
B:	-2.053	4082	0.040	#	0.0	0.00	1	457	0.0
C:	-2.472	4082	0.014	#	13.86	28546.61	1	925	0.449
D:	-1.625	4082	0.104	#	19.74	42824.21	1	1442	0.665

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS									
F-TEST TABLE									
GROUPS		YEARS		#	SS		DF		
=====		1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO
EARLY		56.99	61.18	#	11833.58	3285344.35	1	2710	9.761
LATE		63.23	69.61	#	13104.84	1348301.61	1	1288	12.519
MALE		56.35	58.81	#	3242.83	2553518.69	1	2139	2.716
FEMALE		61.94	69.92	#	30900.36	2134653.73	1	1941	28.097
NORTH		53.63	57.55	#	5531.75	1833836.56	1	1446	4.362
SOUTH		62.18	67.36	#	17680.00	2852903.56	1	2634	16.323
PUBLIC		59.96	64.67	#	18247.84	3817816.17	1	3305	15.797
SEPARATE		55.02	61.31	#	7702.07	936104.91	1	775	6.377

FIGURE 104







problem situations provided. Mean scores for all sub-groups ranged between 35 and 45 percent.

## MEASUREMENT (Nine objectives; Figures 106 to 114)

### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

### Hypothesis

Three objectives had significant increases in the proportion of students achieving at the 85-100 percent level in 1979 from 1978.

### Findings

Even though the students performed significantly better on metric measurement items for the 1979 test session than in 1978, achievement was still low.

About thirty-six percent of the pupils in 1979 could estimate and measure using millimetres with 100 percent accuracy. An equal proportion of pupils could correctly respond to not more than one of the five items.

Over seventy percent of the grade four pupils could not express equivalent measures within units of capacity, mass, length and time (Figure 108). A similar proportion of students had difficulty with expressing linear measure to the nearest hundredth. Equivalent measures were used to test this understanding of decimals (Figure 114).

Forty-seven percent of students could read the Celsius



thermometer with particular reference to freezing and boiling points of water, body and average room temperatures to 75 or 100 percent levels of accuracy.

Most pupils were aware of which standardized measuring units to use for various linear, capacity, and mass situations. About sixty percent of the students were at levels C and D (65-100 percent).

Although students improved their performance on reading and writing time to minutes from 1978 to 1979, still only one student in four could handle the five clock items with 100 percent accuracy. About half of the pupils could read only two or fewer of the clocks.

Significantly more grade four pupils could find the perimeter of regular polygons without using the formulae in 1979 than in 1978. Still over one-third of the pupils could not do so. Forty-six percent of the pupils could calculate the perimeter for three of the four problems.

One-third of the students could not find the area of regular figures by counting squares. The remaining two-thirds were, however, able to do solve for two of the three area problems.

Grade four pupils had difficulty with the four problem situations that required the use of money (coins and bills) for purchasing articles and making change. Two-thirds of the pupils could solve no more than two such problems and most of these one or none. The remaining one-third of the pupils correctly answered three or four of the money items.



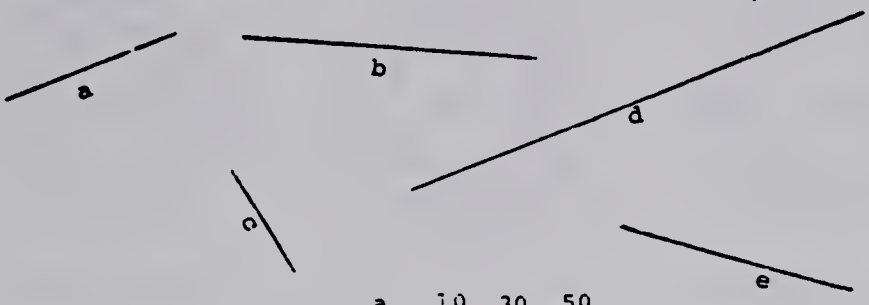
LEVEL D (Grade 4)

MEASUREMENT

OBJECTIVE 1 Extends estimation and measurement to include the use of the standard units, mm, ml, and g .

TEST ITEMS

1. Estimate the length of each line segment in millimetres and circle the best answer.



- a. 10, 30, 50
- b. 50, 35, 70
- c. 10, 20, 30
- d. 60, 80, 110
- e. 20, 40, 60

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:3 CEJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	40.52	36.36	13.90	11.88	13.62	14.78	31.96	36.97
MEAN (X)	20.14	20.50	60.00	60.00	80.00	80.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST		
HO: PRCPOR78=PROPOR79	#		SS	DF	
I-CALC	DE	PRCB	#	BETWEEN	WITHIN
A:	2.727	4082	0.006	#	51.34
B:	1.519	4082	0.055	#	439002.19
C:	-1.064	4082	0.288	#	1
D:	-3.369	4082	0.001	#	1571

0.184 0.668  
SSW IS EQUAL TO ZERO  
SSW IS EQUAL TO ZERO  
SSW IS EQUAL TO ZERO

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE		
GROUPS	YEARS	#
=====	1978	1979
EARLY	58.48	62.51
LATE	60.90	66.16
MALE	60.70	62.82
FEMALE	57.93	64.02
NORTH	61.08	60.12
SOUTH	58.36	65.08
PUBLIC	58.42	64.12
SEPARATE	63.48	60.36

FIGURE 100







LEVEL D (Grade 4)

MEASUREMENT

OBJECTIVE 3 Expresses equivalent measures within units of capacity, mass, length and time. (e.g. 1 dm = 10 cm).

TEST ITEMS

3. Fill in the blanks to make the following measures equal.

- A.        dm = 55 cm

B.        m = 6 km

C.        dm = 7 m

D. 150 cm =        m
- E. 6 hours =        minutes

F. 13 cm =        mm

G. 600 secs. =        minutes

H. 9 l =        ml

I. 6 kg =        g

ANALYSIS

~~ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D~~  
CRITERION CATEGORIES FOR GRADE:4 STRAND:3 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	78.35	71.86	5.86	7.47	9.50	12.04	6.29	8.63
MEAN (%)	13.63	15.05	55.56	55.56	72.28	72.01	93.15	92.61

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	4.794	4082	0.000	#	1540.29	709454.92	1	3070	6.665 0.010
B:	-2.056	4082	0.040	#	0.0	0.00	1	269	0.0 1.000
C:	-2.614	4082	0.009	#	7.71	13599.95	1	436	0.247 0.619
D:	-2.858	4082	0.004	#	21.37	8559.49	1	301	0.752 0.387

~~COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS~~

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978		1979				
			#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	24.79	29.66	#	16069.80	2317004.87	1	2710	18.795	0.000
LATE	30.49	35.12	#	6930.05	1194133.60	1	1288	7.475	0.006
MALE	28.74	32.83	#	8933.18	1962449.38	1	2139	9.737	0.002
FEMALE	24.44	30.26	#	16425.44	1638852.33	1	1941	19.454	0.000
NORTH	22.61	24.30	#	1032.61	1157094.99	1	1446	1.290	0.256
SOUTH	29.01	35.43	#	27193.75	2382219.45	1	2634	30.068	0.000
PUBLIC	27.37	32.81	#	24407.52	2999858.98	1	3305	26.890	0.000
SEPARATE	23.56	26.80	#	2040.65	598624.14	1	775	2.642	0.105

FIGURE 108







## LEVEL D (Grade 4)

## MEASUREMENT

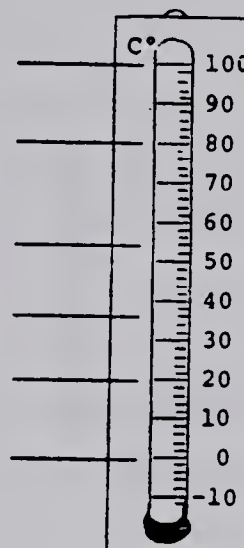
## OBJECTIVE 5

Reads Celsius thermometer (familiarity with freezing and boiling points of water, body and environmental temperatures).

## TEST ITEMS

5. Place the letter of each item below next to its Celsius temperature on the thermometer. Use only four blanks.

- A. Human Body Temperature
- B. Water Freezes
- C. Water Boils
- D. Average Room Temperature



## ANALYSIS

-ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D-  
CRITERION CATEGORIES FOR GRADE:4 STRAND:3 CEJECTIVE: 5

TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	28.94	27.88	28.94	24.68	13.85	14.37	28.27	33.06
MEAN (%)	9.44	9.13	50.10	50.18	75.00	75.00	99.58	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PRCPOR78=PRCPGR79			#	SS		DF			
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	0.746	4082	0.456	#	27.10	171771.45	1	1159	0.183	0.669
B:	3.064	4082	0.002	#	1.64	1852.86	1	1096	0.973	0.324
C:	-0.476	4082	0.634	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-3.318	4082	0.001	#	0.14	155.99	1	1247	1.089	0.297

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	54.20	56.78	#	4499.94	3699258.35	1	2710	3.297	0.070
LATE	58.95	62.27	#	3554.33	1517933.68	1	1288	3.016	0.083
MALE	55.33	59.15	#	7803.08	2811402.60	1	2139	5.937	0.015
FEMALE	56.48	58.35	#	1684.11	2541793.60	1	1941	1.286	0.257
NORTH	48.27	50.06	#	1143.23	2067689.64	1	1446	0.799	0.371
SOUTH	60.29	63.30	#	5974.34	3137932.32	1	2634	5.015	0.025
PUBLIC	56.25	58.58	#	6142.40	4273334.75	1	3305	4.751	0.030
SEPARATE	54.28	57.93	#	2587.86	1079308.05	1	775	1.858	0.173

FIGURE 110







## LEVEL D (Grade 4)

## MEASUREMENT

**OBJECTIVE 7** Uses appropriate standardized measuring units.

## TEST ITEMS

7. Circle the best answer.

A. The weight of a chocolate bar would be expressed in:

- a. milligrams
- b. grams
- c. kilograms

B. Your body weight would be expressed in:

- a. milligrams
- b. grams
- c. kilograms

C. The amount of water in a swimming pool will be expressed in.

- a. millilitre
- b. litres
- c. kilolitres

D. the amount of milk in a glass of milk would be measured in:

- a. millilitres
- b. litres
- c. kilolitres

8. A. Circle the type of unit you would most likely use to measure the distance around a swimming pool.

- a. metres
- b. centimetres
- c. kilometres

B. The width of your desk would be expressed in:

- a. kilometres
- b. centimetres
- c. millimetres

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:3 OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	24.30	20.82	20.24	17.12	41.61	44.45	13.65	17.57
MEAN (%)	22.60	22.72	50.00	50.00	74.09	74.71	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PRCPOR78=PRPOR79			#	SS		DF			
	I-CALC	DE	FRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROP
A:	2.656	4082	0.008	#	3.45	168527.09	1	922	0.019	0.691
B:	2.554	4082	0.011	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
C:	-1.859	4082	0.063	#	170.77	121145.82	1	1754	2.473	0.116
D:	-3.269	4082	0.001	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EAPLY	58.37	62.07	#	8288.64	2104772.65	1	2710	10.672	0.001
LATE	63.74	67.72	#	5114.22	832658.39	1	1268	7.911	0.005
MALE	62.60	64.90	#	2845.24	1611950.02	1	2139	3.776	0.052
FEMALE	57.83	63.19	#	13940.52	1382926.01	1	1941	19.566	0.000
NORTH	55.55	60.25	#	7971.17	1262065.66	1	1446	9.133	0.003
SOUTH	63.03	66.10	#	6193.10	1703576.76	1	2634	9.576	0.002
PUBLIC	61.91	64.51	#	5570.23	2361678.88	1	3305	7.795	0.005
SEPARATE	53.15	62.44	#	16731.15	620665.02	1	775	20.885	0.000

FIGURE 112











## GEOMETRY (Three items; Figures 115 to 117)

### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent category.

### Hypothesis 2

Two objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

Three-quarters of the grade four students correctly identified congruent polygons from a set of mixed shapes. Performance was similar for the two years with sub-group means in the 70 to 78 percent range.

Student performance on identifying the axis of symmetry in a symmetric figure rose 14 percent for 1979 to where about one-half of the students could correctly draw all lines of symmetry on a rectangle.

Significant gains in the proportion of students who could identify translations (slides), reflections (flips), and rotations (turns) were made in the 1979 testing. Forty-six percent of the pupils could correctly perform at least three of the four transformations. The remaining fifty-four percent of the grade four pupils succeeded on two or fewer of the items.



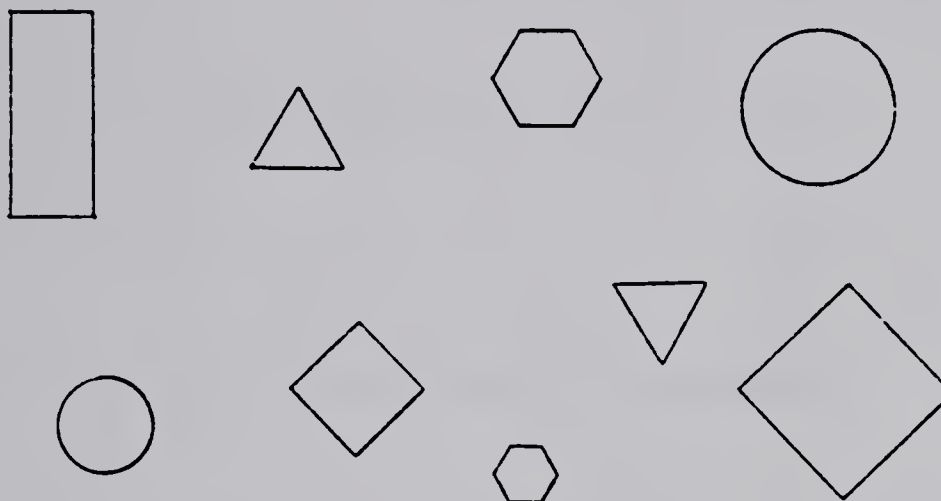
## LEVEL D (Grade 4)

# GEOMETRY

**OBJECTIVE 1** Recognizes congruency of polygons.

## TEST ITEMS

12. Circle the two simple figures that are congruent.



## ANALYSIS

-ZONE ONE--PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:4 STRAND:4 DEJECTIVE: 1

TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	26.19	24.48	0.05	0.10	0.14	0.05	73.62	75.37
MEAN (%)	0.10	0.80	50.00	50.00	71.43	71.43	100.00	99.96

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PROPOR78=PROPOR79			#	SS		DF			
	T-CALC	DE	P-VAL	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VAL
A:	1.258	4082	0.209	#	125.25	11011.97	1	1034	11.761	0.001
B:	-0.640	4082	0.522	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	0.930	4082	0.353	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-1.282	4082	0.200	#	0.28	407.61	1	3039	2.100	0.148

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		E-RATIO	F-DF
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	72.71	73.69	#	657.17	5287016.58	1	2710	0.337	0.562
LATE	75.59	78.98	#	3712.09	2246506.07	1	1288	2.128	0.145
MALE	71.13	73.77	#	3743.58	4241895.31	1	2139	1.888	0.170
FEMALE	76.59	77.76	#	655.89	3404472.67	1	1941	0.374	0.541
NORTH	68.88	69.67	#	225.46	3072604.58	1	1446	0.106	0.745
SOUTH	76.60	78.74	#	3010.42	4531588.85	1	2634	1.750	0.186
PUBLIC	73.91	75.23	#	1451.41	6230747.33	1	3305	0.770	0.381
SEPARATE	73.16	77.29	#	3314.05	1437682.86	1	775	1.786	0.182

FIGURE 115







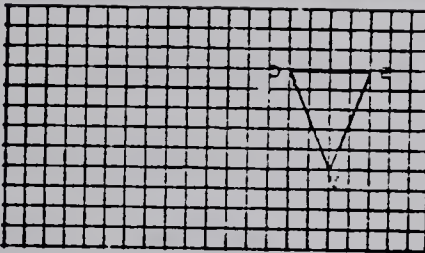
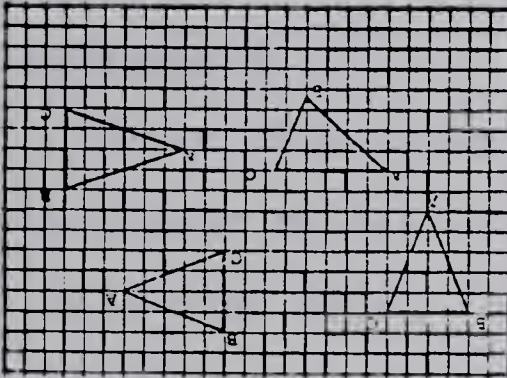
# LEVEL D (Grade 4)

## GEOMETRY

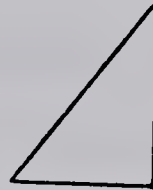
OBJECTIVE 3 *Identifies translations (slides), reflections (flips), and rotations (turns).*

### TEST ITEMS

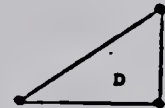
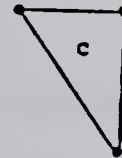
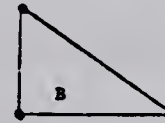
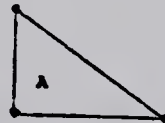
14. Look at the triangle below. On the grid paper with 4 triangles, circle the image which makes a 1/4 turn around A in a clockwise direction.



15. Draw a flip image to go with the figure given.



16. Circle the figure that is the slide image of figure A.



### ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
 CRITERION CATEGORIES FOR GRADE:4 STRAND:4 OBJECTIVE: 3  
 TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	42.46	36.72	16.88	17.62	17.83	16.56	22.84	29.10
MEAN (%)	20.86	21.17	57.18	57.18	71.45	71.45	99.91	99.85

#### TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HC: FRCPOR78=PROPOR79				SS		DF			
	T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CCF
A:	3.746	4082	0.000	37.97	402472.01	1	1619	0.153	0.696
B:	-0.629	4082	0.530	0.00	611.09	1	702	0.000	0.987
C:	1.073	4082	0.283	0.00	101.75	1	701	0.011	0.918
D:	-4.569	4082	0.000	0.14	1366.54	1	1054	0.111	0.735

#### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CCF
=====	1978	1979	#						
EARLY	52.46	56.95	#	13671.98	3102854.10	1	2710	11.941	0.001
LATE	57.03	61.89	#	7599.73	1361834.26	1	1268	7.188	0.007
MALE	53.55	57.74	#	9380.50	2371072.27	1	2139	8.462	0.004
FEMALE	54.61	59.90	#	13561.81	2197151.53	1	1941	11.981	0.001
NORTH	50.67	49.67	#	361.52	1802025.30	1	1446	0.290	0.590
SOUTH	56.02	63.46	#	36478.17	2670763.22	1	2634	35.976	0.000
PUBLIC	55.38	59.47	#	13799.18	3777348.57	1	3305	12.074	0.001
SEPARATE	48.25	55.79	#	11059.82	773348.16	1	775	11.083	0.001

FIGURE 117



## GRAPHING (Four objectives; Figures 118 to 121)

### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

### Hypothesis 2

Three objectives had significantly increases in the proportions of pupils achieving at the 85-100 percent level in 1979 over 1978.

### Findings

About seven in ten students in 1979 could recognize and read a bar, line and circle graph to the 85-100 percent level. Achievement means for all sub-groups in 1979 were from 76 percent for the North Zone students to 87 percent for late starters. These sub-groups are not mutually exclusive, however, so direct comparisons are not that meaningful.

Two-thirds of the students in the 1979 group could construct both the pictograph and the bar graph with 98 percent accuracy.

Two-thirds of the students in the second year of testing could identify coordinates from ordered pairs in two of the three test items. About one-half of the students in 1979 received 100 percent scores for the objective. Close to fifty percent of the pupils in 1978 and 1979 could not generate ordered pairs from a given relationship, however about forty percent of the grade four's could do so with 100



LEVEL D (Grade 4)

GRAPHING

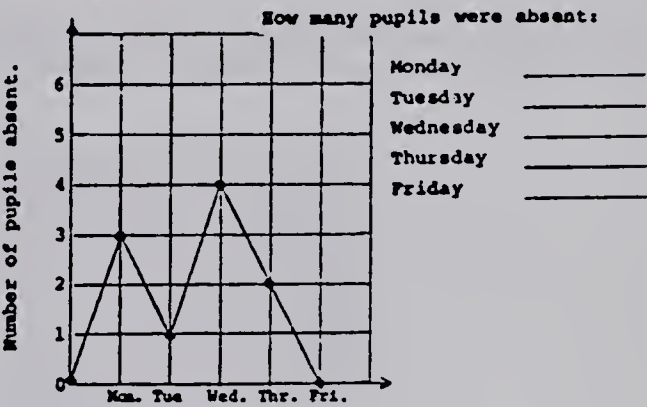
OBJECTIVE 1 Recognizes and reads bar, line, circle and pictographs.

TEST ITEMS

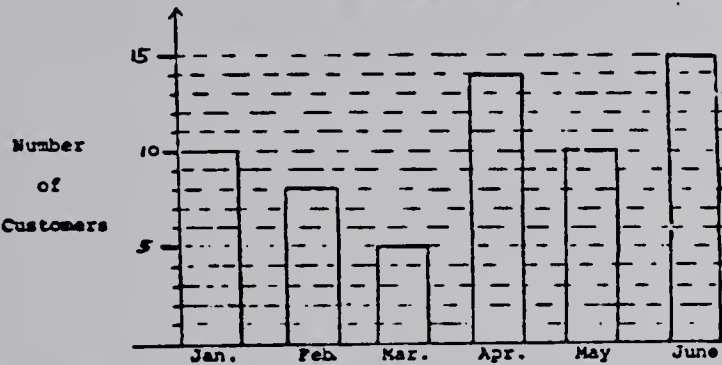
17. The circle graph shows how John spent his allowance last month. List in order the things he spent his money on. Start with the thing he spent most on, and finish with the thing he spent the least on.



19. Read the line graph below and answer the question that follows:



18. This graph shows the number of customers Ed had each month for a half year on his paper route.



- A. What month did Ed have the fewest customers?
- B. How many customers did he have during the month of fewest customers?
- C. What month did Ed have the most customers?
- D. How many customers did he have during the month he had the most customers?

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D. CRITERION CATEGORIES FOR GRADE:4 STRAND:5 OBJECTIVE: 1 TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	11.49	11.38	5.58	4.22	17.83	15.08	65.11	69.32
MEAN (%)	23.10	22.17	57.18	57.35	72.48	72.01	98.37	98.30

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	F-DEG
A:	0.113	4082	0.910	#	100.27	159096.11	1	465	0.293	0.589
B:	2.013	4082	0.044	#	1.48	2164.14	1	199	0.136	0.713
C:	2.358	4082	0.019	#	37.57	17385.25	1	672	1.452	0.229
D:	-2.868	4082	0.004	#	4.15	39545.85	1	2740	0.287	0.592

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		E-RATIO	F-DEG
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	80.98	82.11	#	870.12	2055222.44	1	2710	1.147	0.284
LATE	86.96	87.47	#	85.57	638816.21	1	1288	0.173	0.678
MALE	82.98	83.56	#	179.65	1457464.45	1	2139	0.264	0.608
FEMALE	82.64	84.39	#	1485.59	1314824.95	1	1941	2.193	0.139
NORTH	77.12	76.07	#	397.82	1375666.88	1	1446	0.418	0.518
SOUTH	86.10	88.03	#	2455.30	1293727.79	1	2634	4.999	0.026
PUBLIC	84.02	83.24	#	501.07	2224011.46	1	3305	0.745	0.388
SEPARATE	77.49	86.84	#	16965.76	531087.78	1	775	24.758	0.000

FIGURE 118



LEVEL D (Grade 4)

GRAPHING

OBJECTIVE 2      Constructs line, bar and pictographs.

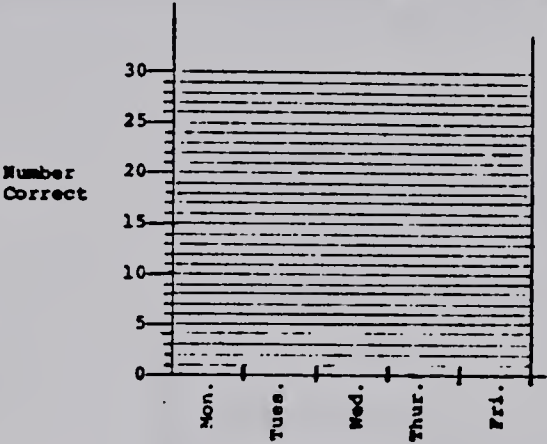
TEST ITEMS

20. In a field trip, Mary's class saw 5 birds, 6 mice, 7 spruce trees, and 2 snakes. Draw a pictograph to show this information.

WHAT WE SAW ON A FIELD TRIP

Birds									
Mice									
Spruce Trees									
Snakes									

21. Every day last week John had a math quiz. Here is how he scored. Draw a bar graph to show how well he did.



Monday - 15 right  
Tuesday - 17 right  
Wednesday - 25 right  
Thursday - 12 right  
Friday - 20 right

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:5 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	27.23	20.01	9.08	6.04	6.19	7.47	57.49	66.48
MEAN (%)	23.51	24.31	55.64	55.70	74.30	73.56	97.95	98.38

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HC: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PRCB
A:	5.421	4082	0.000	147.65	418001.00	1	968	0.342	0.559
B:	3.653	4082	0.000	0.21	428.32	1	309	0.150	0.699
C:	-1.613	4082	0.107	35.66	7094.30	1	276	1.387	0.240
D:	-5.907	4082	0.000	118.93	42571.45	1	2523	7.048	0.008

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS				SS		DF			
YEARS									
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PRCB
EARLY	71.04	76.91	#	23311.98	3132947.67	1	2710	20.165	0.000
LATE	74.76	82.88	#	21258.99	1205215.87	1	1268	22.708	0.000
MALE	69.77	77.26	#	29982.12	2459576.53	1	2139	26.074	0.000
FEMALE	75.15	81.26	#	18061.91	1949205.14	1	1941	17.986	0.000
NORTH	68.75	75.07	#	14375.92	1791971.51	1	1446	11.600	0.001
SOUTH	74.47	81.24	#	30213.00	2607070.20	1	2634	30.525	0.000
PUBLIC	73.57	78.07	#	16760.16	3609372.81	1	3305	15.347	0.000
SEPARATE	67.11	83.46	#	51961.67	800226.31	1	775	50.324	0.000

FIGURE 119



LEVEL D (Grade 4)

GRAPHING

OBJECTIVE 3 *writes co-ordinates as ordered pairs.*

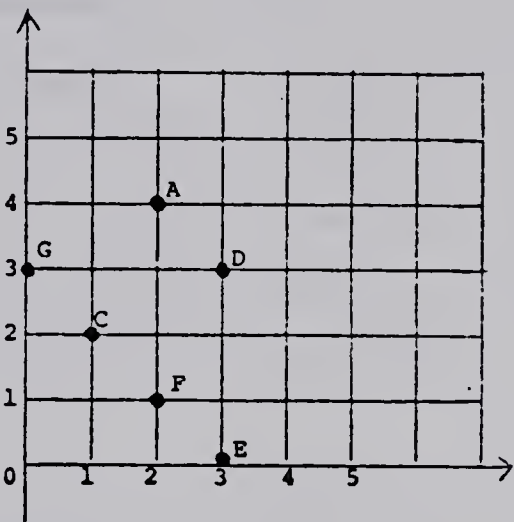
TEST ITEMS

22. Give the letters for each pair of co-ordinates from the graph to the right.

(1, 2) \_\_\_\_\_

(3, 3) \_\_\_\_\_

(3, 0) \_\_\_\_\_



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:4 STRAND:5 DEJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	43.40	32.76	0.0	0.0	16.78	17.83	39.81	46.42
MEAN (X)	10.86	11.11	*****	*****	66.67	66.67	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HO: PRCPOR78=PRCPOR79	#		SS	DF				
T-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO
A:	6.995	4082	0.000	24.47	383274.03	1	1561	0.100
B:	0.0	4082	1.000	<<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>>				
C:	-0.879	4082	0.379	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				
D:	-6.173	4082	0.000	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
GROUPS	YEARS	#	SS	DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO
EARLY	53.62	62.03	#	47837.57	4742354.17	1	2710	27.337
LATE	60.04	70.59	#	35873.38	2068464.26	1	1288	22.338
MALE	54.13	63.45	#	46490.92	3721909.10	1	2139	26.719
FEMALE	57.40	66.63	#	41241.04	3257665.72	1	1941	24.571
NORTH	49.20	56.71	#	20298.99	2544752.43	1	1446	11.534
SOUTH	59.48	69.21	#	62440.68	4324564.88	1	2634	38.031
PUBLIC	57.60	63.07	#	24667.77	5679933.92	1	3305	14.354
SEPARATE	47.40	72.63	#	123600.06	1248929.61	1	775	76.698

FIGURE 120



## LEVEL D (Grade 4)

## GRAPHING

**OBJECTIVE 4** Generates ordered pairs from a given relationship.

## TEST ITEMS

23. Everytime a circus elephant was given 3 peanuts he would perform a trick. Make ordered pairs to show the ratio of peanuts to tricks for the following:

Example: (3, 1)

A. 12 peanuts

B. 15 peanuts

C. 9 peanuts

D. 27 peanuts

## ANALYSIS

~~ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D~~  
~~CRITERION CATEGORIES FOR GRADE 4 STRANDS OBJECTIVES~~

CRITERION CATEGORIES FOR GRADE:4 STRAND:5 OBJECTIVE: 4

TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1569

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	51.73	47.28	3.69	2.89	5.96	0.23	38.63	41.59
MEAN (%)	1.30	1.26	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
	T-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	FREQ
A:	2.838	4082	0.005	0.82	61660.90	1	2023	0.027	0.865
B:	1.417	4082	0.157	<<<<<<<<<<<<	SSW IS EQUAL TC ZERO	>>>>>>>>>>>>			
C:	-2.831	4082	0.005	<<<<<<<<<<<<	SSW IS EQUAL TC ZERO	>>>>>>>>>>>>			
D:	-1.933	4082	0.053	<<<<<<<<<<<<	SSW IS EQUAL TC ZERO	>>>>>>>>>>>>			

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	F-CR
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	44.25	46.90	#	4727.67	6014140.33	1	2710	2.130	0.145
LATE	48.99	54.22	#	8813.14	2873474.17	1	1288	3.950	0.047
MALE	45.11	49.45	#	10105.75	4742872.42	1	2139	4.558	0.033
FEMALE	46.16	50.22	#	7976.09	4353007.57	1	1941	3.557	0.060
NORTH	41.97	43.24	#	582.33	3194862.68	1	1446	0.264	0.608
SOUTH	47.72	53.22	#	19911.59	5841483.28	1	2634	8.978	0.003
PUBLIC	47.07	48.25	#	1141.75	7322467.75	1	3305	0.511	0.475
SEPARATE	39.19	56.22	#	56289.53	1668798.95	1	775	26.141	0.000

FIGURE 121



percent accuracy.

#### A. DISCUSSION OF THE GRADE FOUR RESULTS

The 1978 and 1979 mathematics achievement in grade four, determined by the zone one tests, is somewhat low. The evidence in Tables 14, 15 and 15 shows this to be the case for many individual objectives and also for the total strand.

How much of the poor performance can be attributed to the fact that the grade four program contains the largest number of objectives (35) is unclear. There are some new concepts introduced, however the primary emphasis is with objectives that represent extensions from the earlier grades.

##### Number

The five place value objectives involving such skills as identifying value of digits in numerals, regrouping, rounding, and reading and writing numerals, exemplify the extension principal. The low achievement trend in these topics was even more dramatic at the grade four level than in previous grades. If one considers that such skills as place value are to be part of the "minimum" essentials in the program and it is generally agreed that they are, something is wrong.

Although pupils do have difficulty with decimals to hundredths, the test results from questions three and four in Figure 88 indicate that decimals themselves may not be



TABLE 14  
THE 1978 AND 1979 ZONE ONE MEAN SCORES FOR GRADE  
FOUR BY OBJECTIVES AND STRAND

ZONE ONE		GRADE FOUR				JUNE/78			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	48.4%	1	59.6%	1	59.4%	1	73.8%	1	82.8%
2	43.7%	2	40.5%	2	48.0%	2	44.4%	2	72.4%
3	43.6%	3	37.0%	3	26.7%	3	54.1%	3	55.7%
4	76.6%	4	52.1%	4	44.9%			4	45.6%
5	37.7%	5	53.2%	5	55.9%				
6	56.7%	6	68.5%	6	56.6%				
7	49.2%	7	40.9%	7	60.3%				
8	9.6%	8	50.3%	8	43.6%				
9	44.8%	9	59.0%	9	12.8%				
		10	80.5%						
-----									
AVG	45.6%		54.2%		45.3%		57.4%		64.1%

ZONE ONE		GRADE FOUR				JUNE/79			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	58.7%	1	61.2%	1	63.4%	1	75.6%	1	83.9%
2	53.8%	2	43.3%	2	52.8%	2	56.2%	2	79.1%
3	50.3%	3	43.1%	3	31.6%	3	58.7%	3	64.9%
4	79.8%	4	54.4%	4	52.6%			4	49.8%
5	45.6%	5	54.0%	5	58.8%				
6	60.2%	6	70.5%	6	60.7%				
7	57.9%	7	41.3%	7	64.1%				
8	16.2%	8	49.7%	8	46.7%				
9	49.8%	9	64.0%	9	21.8%				
		10	81.0%						
-----									
AVG	52.5%		56.2%		50.2%		63.5%		69.5%

the problem. There may be a general lack of understanding due to handling place value at the abstract level only. This could occur from the rote learning associated with teaching



TABLE 15

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D,  
CRITERION CATEGORIES FOR GRADE:4 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	58.87	47.28	15.58	18.28	17.40	20.92	7.75	13.51
MEAN (%)	28.02	29.64	57.15	57.00	73.87	74.37	91.66	92.42

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	EECB
A:	7.413	4082	0.000	#	1396.93	369697.13	1	2174	8.215 0.004
B:	-1.953	4082	0.051	#	3.95	11657.55	1	696	0.236 0.627
C:	-2.863	4082	0.004	#	47.94	26041.82	1	778	1.432 0.232
D:	-5.688	4082	0.000	#	58.05	10198.10	1	428	2.436 0.119

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D,  
CRITERION CATEGORIES FOR GRADE:4 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	42.79	38.09	20.95	21.94	25.53	28.29	10.73	11.68
MEAN (%)	31.56	32.05	57.36	57.01	74.35	74.12	90.16	90.34

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	EECB
A:	3.057	4082	0.002	#	100.69	268548.61	1	1653	0.620 0.431
B:	-0.774	4082	0.439	#	26.34	14842.79	1	873	1.549 0.214
C:	-1.986	4082	0.047	#	15.24	36690.32	1	1055	0.455 0.500
D:	-0.960	4082	0.337	#	3.77	7690.42	1	455	0.223 0.637

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D,  
CRITERION CATEGORIES FOR GRADE:4 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	59.05	49.87	20.38	22.04	16.97	22.45	3.59	5.64
MEAN (%)	30.62	31.90	56.91	57.02	73.44	73.92	88.55	90.42

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	EECB
A:	5.889	4082	0.000	#	897.51	356056.98	1	2229	5.619 0.018
B:	-1.300	4082	0.194	#	3.03	15078.35	1	863	0.174 0.677
C:	-4.402	4082	0.000	#	44.96	27252.69	1	799	1.318 0.251
D:	-3.123	4082	0.002	#	97.26	2608.29	1	165	6.899 0.009



TABLE 16  
ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE GEOMETRY AND GRAPHING STRANDS

<u>ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D</u>									
CRITERION CATEGORIES FOR GRADE:4 STRAND: GEOMETRY									
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969									
A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%			
<u>1978</u>		<u>1979</u>		<u>1978</u>		<u>1979</u>		<u>1978</u>	
NUMBER (%)	36.60	30.12	17.07	13.81	22.65	21.74	23.69	34.33	
MEAN (%)	24.60	25.05	55.60	55.27	74.15	73.30	93.43	94.40	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
H0: PROPOR78=PROPOR79			SS				DF		
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EFCE
A:	4.384	4082	0.000	#	66.08	385801.14	1	1365	0.234 0.629
B:	2.272	4082	0.004	#	16.97	8835.18	1	631	1.212 0.271
C:	0.700	4082	0.484	#	163.98	34916.80	1	905	4.250 0.040
D:	-7.505	4082	0.000	#	271.66	44675.42	1	1175	7.145 0.008
<u>ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D</u>									
CRITERION CATEGORIES FOR GRADE:4 STRAND: GRAPHING									
TOTAL NUMBER OF PUPILS: 1978 N=2115 1979 N=1969									
A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%			
<u>1978</u>		<u>1979</u>		<u>1978</u>		<u>1979</u>		<u>1978</u>	
NUMBER (%)	28.75	20.01	18.53	15.95	24.66	29.00	28.04	35.04	
MEAN (%)	29.74	27.25	56.85	57.14	74.21	73.90	95.32	95.48	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
H0: PROPOR78=PROPOR79			SS				DF		
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EFCE
A:	6.484	4082	0.000	#	1478.79	246793.02	1	1000	5.992 0.015
B:	2.185	4082	0.029	#	14.83	15399.48	1	704	0.678 0.411
C:	-3.115	4082	0.002	#	26.87	32693.22	1	1091	0.897 0.344
D:	-4.819	4082	0.000	#	6.34	31871.52	1	1261	0.335 0.563



the regrouping patterns in the algorithms.

The above notion of teaching in the abstract is supported in part by the results from the common fraction and ratio items. Pupils could write fractions or simple ratios from drawings or pictures however they had difficulty at the symbolic level.

### Operations and Properties

Although both the multiplication and division processes were introduced at the grade two level, and extended in grade three, pupils in grade four lack success with the operations. There are perhaps many reasons for this. Certainly the place value deficiency would influence the results. The lack of mastery on the basic facts may be another (Figure 101). The continual 'progressing' of students who do not have sufficient understanding, and the lack of suitable management systems whereby student weakness can be identified, may also be at work.

The complexity of the addition and subtraction items in Figure 96 may be the main reason for the spreading of the scores within the four categories. A more realistic range in difficulty may have given better readings of students understanding.

### Measurement

It appears as though some of the measurement concepts introduced at the grade four level are either too difficult or they are not being taught. The achievement means for using equivalent measures within units of capacity, mass,



length and time and the expressing of linear measures to thousandths (Figures 108 and 114), seem to be excessive. With about one-third of the grade four pupils still struggling with the choosing of appropriate standardized measuring units (Figure 112), it seems over demanding to expect high results from the more difficult objectives. Even with the significant increases in performance for 1979 the overall performance on the strand is low.

It is unclear from the perimeter item (Figure 109) whether the one-third failure rate is due to a lack of understanding or a lack of measuring skills. An item on perimeter only may have been more appropriate.

Since the reading and writing of time to the quarter hour gave the grade three students trouble, and since many grade four pupils experience the same difficulty with time to minutes, it may be that the teaching of time is somewhat haphazard. This is however assuming that the clock items are drawn with sufficient accuracy to be valid or that pupils are both able and motivated to learn time concepts.

### Geometry

Since grade four is the first introduction to transformational geometry, students showed fair understanding of translation, reflection and rotation items.

Many of the pupils who could not identify the axis of symmetry for the rectangle in item 13 of Figure 116 may have been tricked into considering the diagonals as being axis lines. This is the case for the square but not for the



rectangle.

### Graphing

Performance for both the reading and constructing of the various graphs is up considerably from the earlier grades. Students do however have some difficulties with the two objectives that involve the use of coordinates.

The test items used to measure coordinate understanding may be somewhat inappropriate. Objective three in Figure 120 deals with the writing of coordinates as ordered pairs but the test item requires only a reading of coordinates. Because of this the item may be easier than the one used at the grade three level.



## CHAPTER VIII

### GRADE FIVE

#### ANALYSIS OF HYPOTHESIS ONE AND TWO FOR GRADE FIVE

NUMBER (Six objectives; Figures 124 to 129)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent category.

##### Hypothesis 2

Five objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

##### Findings

Although more students in 1979 were able to express tenths, hundredths and thousandths as fractions or decimals still about forty percent of the students could do only six or fewer of the ten items. The mean performance for all students was about 66 percent.

Place value related skills continued as a primary difficulty for many students. Two-thirds of the pupils had achievement figures below the 50 percent level on the items measuring the identification and use of place value for the digits 0.001 to 999 999.

Rounding numbers, also a place value skill, was handled reasonably well for whole numbers (seventy percent of the



PART 1

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
1	1	Number	1	20
1	2	Number	2	20
1	3	Number	3	8
1	4	Number	3	6
1	5	Number	4	20
1	6	Number	5	16
1	7	Number	6	10
1	8	Number	6	6
			S U B - T O T A L = 106	
			Raw Score $\div$ 3 = 35%	
1	9	Operations & Properties	1	8
1	10	Operations & Properties	2	6
1	11	Operations & Properties	3	6
1	12	Operations & Properties	4	4
1	13	Operations & Properties	4	4
1	14	Operations & Properties	6	6
1	15	Operations & Properties	6	6
1	16	Operations & Properties	6	8
1	17	Operations & Properties	6	8
1	18	Operations & Properties	7	6
1	19	Operations & Properties	7	6
1	20	Operations & Properties	7	6
1	21	Operations & Properties	5	4
1	22	Operations & Properties	5	4
1	23	Operations & Properties	5	4
1	24	Operations & Properties	5	4

FIGURE 122  
GRADE FIVE DETAILED ANALYSIS OF MARK WEIGHTINGS



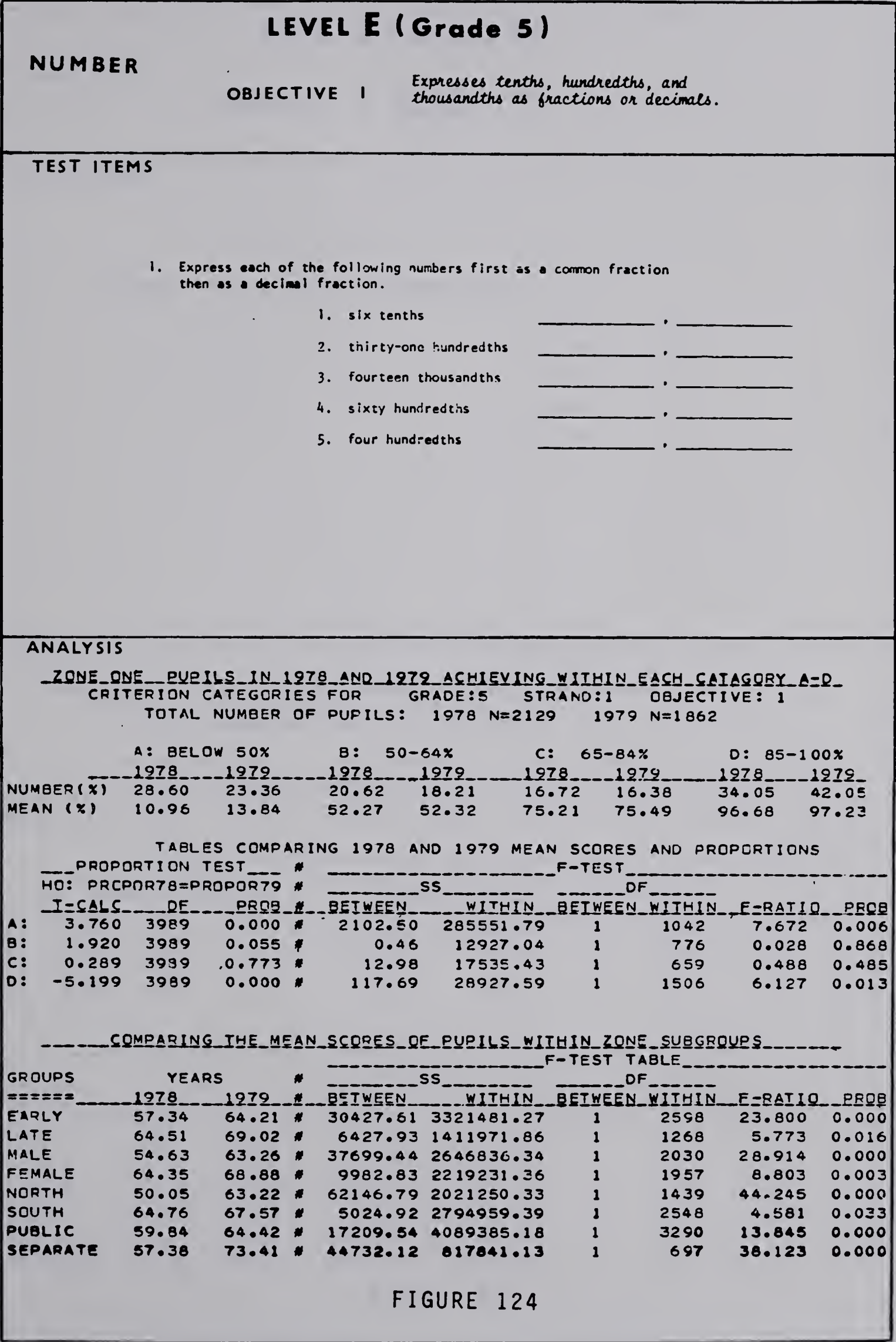
PART II

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
II	1	Measurement	1	1
II	2	Measurement	1	1
II	3	Measurement	2	4
II	4	Measurement	3	3
II	5	Measurement	4	4
II	6	Measurement	5	3
II	7	Measurement	6	2
II	8	Measurement	7	3
II	9	Measurement	7	4
II	10	Measurement	8	6
II	11	Measurement	9	1
II	12	Measurement	9	2
II	13	Measurement	9	4
II	14	Measurement	10	4

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
II	15	Geometry	1	4
II	16	Geometry	1	4
II	17	Geometry	1	2
II	18	Geometry	1	2
II	19	Geometry	2	8
II	20	Geometry	3	8
II	21	Geometry	4	3
II	22	Geometry	4	2
II	23	Geometry	4	2
SUB-TOTAL = 35				
Sub-Total ÷ 3 = 12				
II	24	Graphing	1	3
II	25	Graphing	1	3
II	26	Graphing	1	3
II	27	Graphing	2	3
II	28	Graphing	2	3
II	29	Graphing	3	4
II	30	Graphing	4	4
II	31	Graphing	5	4

FIGURE 123  
GRADE FIVE DETAILED ANALYSIS OF MARK WEIGHTINGS







LEVEL E (Grade 5)

NUMBER

OBJECTIVE 2 *Rounds whole numbers. (limit: 5-digit accuracy).*

TEST ITEMS

2. Round the following numbers to the nearest thousand.

- A. 2 901
- B. 7 499
- C. 4 099
- D. 8 610
- E. 1 490

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:1 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	28.46	23.09	6.06	5.91	8.74	9.13	56.74	61.87
MEAN (%)	9.27	10.34	59.77	59.82	80.00	79.97	100.00	99.92

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	3.861	3989	0.000	#	284.37	233656.63	1	1034	1.258 0.262
B:	0.201	3989	0.841	#	0.15	489.39	1	237	0.074 0.786
C:	-0.435	3989	0.664	#	0.08	24.85	1	354	1.094 0.296
D:	-3.288	3989	0.001	#	3.60	892.97	1	2358	9.504 0.002

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN
								F-RATIO	PROB
EARLY	67.95	74.31	#	26014.37	4156323.85	1	2598	16.261	0.000
LATE	74.47	76.20	#	945.06	1780658.48	1	1268	0.673	0.412
MALE	71.34	76.56	#	13824.30	3074948.93	1	2030	9.126	0.003
FEMALE	68.60	73.46	#	11506.44	3048685.62	1	1957	7.386	0.007
NORTH	59.76	71.04	#	45592.96	2516681.61	1	1439	26.069	0.000
SOUTH	75.83	77.28	#	1320.75	3471516.51	1	2548	0.969	0.325
PUBLIC	70.12	73.77	#	10859.98	5122890.84	1	3290	6.974	0.008
SEPARATE	69.35	80.97	#	23522.48	994933.60	1	697	16.479	0.000

FIGURE 125



LEVEL E (Grade 5)

NUMBER

OBJECTIVE 3 Identifies and uses place value of digits (0.001 - 999 999).

TEST ITEMS

3. Write the numbers in decimals that contain

- (a) four hundred thousands  
six hundreds  
eleven ones  
forty hundredths

\_\_\_\_\_
- (b) seven ones  
eleven thousands  
eight tenths  
two hundreds

\_\_\_\_\_

4. In the number 826 443 091

- 0 is in the \_\_\_\_\_ place.
- 6 is in the \_\_\_\_\_ place.
- 3 is in the \_\_\_\_\_ place.
- 9 is in the \_\_\_\_\_ place.
- 1 is in the \_\_\_\_\_ place.
- 2 is in the \_\_\_\_\_ place.

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:1 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	77.08	66.38	4.37	6.50	8.83	10.63	9.72	16.49
MEAN (%)	23.23	23.80	59.75	58.21	71.69	71.72	98.34	98.72

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	7.517	3989	0.000	#	223.47	806941.10	1	2875	0.796 0.373
B:	-2.980	3989	0.003	#	126.14	6372.05	1	212	4.197 0.042
C:	-1.923	3989	0.055	#	0.05	735.52	1	384	0.026 0.872
D:	-6.365	3989	0.000	#	17.54	6939.60	1	512	1.294 0.256

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS									
F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	34.41	41.10	#	28836.47	2360741.07	1	2598	31.735	0.000
LATE	41.03	46.05	#	7957.50	1232110.64	1	1268	8.189	0.004
MALE	36.09	44.53	#	36061.82	1942074.03	1	2030	37.694	0.000
FEMALE	36.74	42.39	#	15520.05	1839860.98	1	1957	16.508	0.000
NORTH	29.71	39.92	#	37393.43	1345045.70	1	1439	40.005	0.000
SOUTH	40.24	45.47	#	17347.10	2371409.78	1	2548	18.639	0.000
PUBLIC	35.98	42.49	#	34719.26	3123853.35	1	3290	36.566	0.000
SEPARATE	38.48	48.10	#	16097.85	650005.92	1	697	17.262	0.000

FIGURE 126



LEVEL E (Grade 5)

NUMBER

OBJECTIVE 4 Expresses and generates proportional ratios.

TEST ITEMS

5. The price of bubble gum is 4 packages for 9¢. Complete the following table, expressing each relationship as a proportional ratio. Fill in all the boxes.

No. of packages of gum	Cost	Proportional Ratio
4	9¢	$\frac{4}{9}$
12		
	18¢	
24		
	36¢	
36		

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:1 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	58.99	55.91	10.57	12.08	12.07	9.67	18.37	22.34
MEAN (X)	10.86	12.12	58.13	57.67	78.58	78.22	99.05	99.12

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PROPOR78=PROPOR79				SS		DF		F-RATIO	PROB	
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN			
A:	1.969	3989	0.049	#	906.94	536759.38	1	2295	3.878	0.049
B:	-1.510	3989	0.131	#	24.50	7416.00	1	448	1.480	0.224
C:	2.427	3989	0.016	#	13.53	5787.73	1	435	1.017	0.314
D:	-3.120	3989	0.002	#	0.96	6654.62	1	805	0.116	0.734

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	37.43	42.19	#	14554.61	3871280.01	1	2598	9.768	0.002
LATE	46.89	44.39	#	1972.18	1904311.36	1	1268	1.313	0.252
MALE	39.88	45.51	#	16064.25	2975885.55	1	2030	10.958	0.001
FEMALE	40.59	41.30	#	250.88	3033411.01	1	1957	0.162	0.688
NORTH	34.31	35.91	#	915.16	2037881.44	1	1439	0.646	0.422
SOUTH	43.61	47.66	#	10445.91	3878201.50	1	2548	6.863	0.009
PUBLIC	39.92	43.21	#	8904.02	4951805.40	1	3290	5.916	0.015
SEPARATE	41.69	44.55	#	1416.66	1064548.21	1	657	0.928	0.336

FIGURE 127







LEVEL E (Grade 5)

NUMBER

OBJECTIVE 6 Rounds to tenths and hundredths.

TEST ITEMS

7. Round each decimal to the nearest tenth.

- A. 7.47
- B. 6.89
- C. 7.96
- D. 0.81
- E. 4.03

8. Round 7.156

to the nearest hundredth

to the nearest tenth

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:1 OBJECTIVE: 6  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	52.89	49.19	25.60	25.78	7.89	6.98	13.62	18.05
MEAN (%)	9.64	12.21	55.55	55.48	73.96	74.71	95.13	95.67

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	2.329	3989	0.020	#	3341.33	462559.69	1	2040	14.736 0.000
B:	-0.130	3989	0.897	#	1.20	36637.52	1	1023	0.034 0.855
C:	1.090	3989	0.276	#	41.58	8791.27	1	296	1.400 0.238
D:	-3.834	3989	0.000	#	44.82	22628.96	1	624	1.236 0.267

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====									
	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	36.50	41.18	#	14109.89	3081330.00	1	2598	11.897	0.001
LATE	41.91	44.69	#	2434.56	1533130.77	1	1268	2.014	0.156
MALE	37.17	43.47	#	20096.15	2476021.11	1	2030	16.476	0.000
FEMALE	39.09	42.08	#	4357.57	2294419.51	1	1957	3.717	0.054
NORTH	37.43	37.42	#	0.05	1762491.17	1	1439	0.000	0.995
SOUTH	38.51	45.79	#	33692.44	2980220.57	1	2548	28.806	0.000
PUBLIC	37.24	41.13	#	12372.05	4003828.83	1	3290	10.166	0.002
SEPARATE	42.26	50.49	#	11807.91	738006.45	1	697	11.152	0.001

FIGURE 129



pupils correctly rounded 4 or 5 of the five numbers on the items). The rounding of numbers to tenths and hundredths seemed to compound the difficulties, however. About one-half of the students in 1979 answered but three or fewer of the six items correctly.

Many grade five pupils found the expressing and generating of proportional ratios troublesome. Over one-half of the students achieved well below the 50 percent level. Thirty-two percent of the pupils performed in categories C or D. An only slightly higher proportion of pupils could solve for a missing numeral in proportional ratios.

OPERATIONS AND PROPERTIES (Seven objectives; Figures 130 to 136).

#### Hypothesis 1

None of the objectives had performances whereby eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

#### Hypothesis 2

Two objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

#### Findings

About seventy-six percent of the pupils in 1979 (five percent more than in 1978) could solve at least three of the four addition and subtraction items of two and three digit size. Only six percent of the students could not do more



than one of the problems.

A few more grade five pupils in both years had difficulty with multiplying whole numbers by one, two and three digit multipliers. Still about seventy percent of the Zone One pupils properly used the multiplication algorithms for at least two of the three items.

About one of every two children in grade five could not use the algorithm for dividing whole numbers by one and two digit divisors (with and without remainders). Forty-eight percent of the pupils could give correct answers for two of the three problems provided in the test.

One-third of the pupils in 1979 had below 50 percent scores on estimating products and quotients in problems involving the rounding up or down of factors, divisors and dividends. Forty-three percent of the pupils could do three-quarters or more of the problems.

Performance on the basic facts remained fairly constant over the two years. With speed and accuracy combined, two-thirds of the grade five pupils reached levels C and D (65-100 percent). Forty-five percent of these pupils performed within category D however.

The grade five pupils certainly did not solve the word problems or estimate answers with any degree of success in either year. Two-thirds of the pupils had achievement scores below 50 percent range and only 7 of every 100 pupils came within category D.

The 1979 group of pupils had significantly better



FIGURE 130















LEVEL E (Grade 5)

OPERATIONS  
AND PROPERTIES

OBJECTIVE 5      Demonstrates mastery of basic facts.

TEST ITEMS

21. Add the following. You have 1 minute.

3 + 9 =	4 + 6 =	7 + 9 =	7 + 4 =
9 + 3 =	9 + 5 =	5 + 1 =	2 + 3 =
7 + 7 =	8 + 2 =	6 + 8 =	9 + 8 =
9 + 1 =	4 + 0 =	8 + 3 =	8 + 5 =
8 + 6 =	5 + 9 =	5 + 4 =	8 + 7 =
2 + 8 =	2 + 9 =	5 + 7 =	7 + 3 =

23. Multiply the following. You have 1 minute.

3 x 4 =	0 x 3 =	9 x 4 =	9 x 8 =
6 x 6 =	7 x 9 =	8 x 8 =	8 x 5 =
3 x 2 =	4 x 9 =	9 x 6 =	6 x 3 =
7 x 6 =	1 x 5 =	7 x 4 =	3 x 5 =
2 x 9 =	5 x 6 =	3 x 8 =	8 x 7 =
7 x 7 =	5 x 8 =	8 x 2 =	8 x 9 =

22. Subtract the following. You have 1 minute.

12 - 7 =	9 - 6 =	15 - 8 =	16 - 8 =
11 - 6 =	13 - 6 =	16 - 7 =	8 - 6 =
12 - 5 =	16 - 9 =	15 - 6 =	12 - 4 =
7 - 2 =	11 - 5 =	9 - 8 =	17 - 9 =
13 - 7 =	13 - 9 =	12 - 8 =	14 - 8 =
12 - 6 =	6 - 4 =	14 - 5 =	5 - 3 =

24. Divide the following. You have 1 minute.

12 ÷ 3 =	63 ÷ 9 =	27 ÷ 9 =	18 ÷ 6 =
20 ÷ 4 =	18 ÷ 2 =	49 ÷ 7 =	5 ÷ 5 =
24 ÷ 4 =	64 ÷ 8 =	24 ÷ 3 =	30 ÷ 5 =
24 ÷ 8 =	15 ÷ 5 =	28 ÷ 4 =	42 ÷ 6 =
35 ÷ 5 =	30 ÷ 6 =	21 ÷ 7 =	48 ÷ 6 =
9 ÷ 1 =	36 ÷ 6 =	56 ÷ 8 =	32 ÷ 8 =

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR      GRADE:5      STRAND:2      OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS:    1978 N=2129    1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	11.79	19.44	16.30	15.79	25.46	19.87	46.45	44.90
MEAN (%)	32.77	28.80	56.70	56.93	75.15	75.41	95.46	96.09

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			#	F-TEST						
HO: PROPOR78=PROPOR79			#	SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	-6.688	3989	0.000	#	2336.85	101034.13	1	611	14.132	0.000
B:	0.437	3989	0.662	#	8.42	15613.90	1	639	0.345	0.557
C:	4.194	3989	0.000	#	14.35	22778.57	1	910	0.573	0.449
D:	0.984	3989	0.325	#	178.35	46506.03	1	1823	6.991	0.008

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE							
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB	
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN			
EARLY	75.32	71.54	#	9152.50	1632347.26	1	2598	14.567	0.000	
LATE	79.46	74.24	#	8606.47	680299.44	1	1268	16.041	0.000	
MALE	73.73	71.74	#	2008.00	1300168.12	1	2030	3.135	0.077	
FEMALE	79.53	73.73	#	16389.15	1069541.09	1	1957	29.988	0.000	
NORTH	74.14	73.92	#	16.34	911928.92	1	1439	0.026	0.872	
SOUTH	77.98	72.04	#	22404.41	1468747.55	1	2548	38.867	0.000	
PUBLIC	76.40	71.91	#	16497.17	2037976.68	1	3290	26.632	0.000	
SEPARATE	77.47	76.46	#	179.32	345518.22	1	657	0.362	0.548	

FIGURE 134



OPERATIONS  
AND PROPERTIES

LEVEL E (Grade 5)

OBJECTIVE 6

Solves word problems. Estimates answers.

TEST ITEMS

14. Choose the best estimate from those given for each problem. Write the best answer in the blank at the side.

A. One tank of water can hold about 12 fish. Choose the best estimate for the number of fish 88 tanks would hold.

(a) 800 fish    (b) 100 fish    (c) 900 fish    (d) 1 300 fish

\_\_\_\_\_

B. One truck holds 36 sacks of cement. Estimate the number of trucks needed to hold 278 sacks.

(a) 7    (b) 29    (c) 70    (d) 80

\_\_\_\_\_

15. Choose the best estimate from the ones given for each problem. Write the best answer in the blank at the side.

A. A piece of aluminum has a mass of about 169 grams. A length of lead pipe has a mass of 870 grams. Estimate the difference between the masses of the two objects.

(a) 600 grams    (b) 700 grams    (c) 800 grams    (d) 80 grams

\_\_\_\_\_

B. There are 1 759 bricks in a pile, 1 761 bricks in a second pile, and 1 763 bricks in a third pile. About how many bricks are there in all three piles?

(a) 5 000    (b) 7 000    (c) 3 000    (d) 11 000

\_\_\_\_\_
16. Solve the following problem in the space below. Write your final answer on the blank provided.

Sugar costs \$21.60 a bag. Flour costs \$8.36 a bag less than sugar. How much do 5 bags of flour cost?

\_\_\_\_\_

17. Solve the following problem in the space below. Write your final answer on the blank provided.

There are 4 136 boxes of books to haul. Each truck can haul 28 boxes. How many trucks are needed to haul the books.

\_\_\_\_\_

ANALYSIS

<u>ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.</u>									
CRITERION CATEGORIES FOR GRADE:5 STRAND:2 OBJECTIVE: 6									
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862									
A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%			
<u>1978</u>		<u>1979</u>		<u>1978</u>		<u>1979</u>		<u>1978</u>	
NUMBER (%)	70.22	66.70	15.64	15.90	7.89	9.94	6.25	7.47	
MEAN (%)	20.75	20.63	57.31	57.85	73.62	73.94	89.82	91.34	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
<u>PROPORTION TEST</u>			<u>F-TEST</u>						
HO: PRCPOR78=PROPOR79			<u>SS</u>		<u>DF</u>				
<u>T-CALC</u>	<u>DF</u>	<u>PROB</u>	<u>BETWEEN</u>	<u>WITHIN</u>	<u>BETWEEN</u>	<u>WITHIN</u>	<u>F-RATIO</u>	<u>PROB</u>	
A:	2.389	3989	0.017	10.24	620944.24	1	2735	0.045	0.832
B:	-0.221	3989	0.825	45.74	17352.95	1	627	1.653	0.199
C:	-2.269	3989	0.023	9.02	2659.44	1	351	1.190	0.276
D:	-1.523	3989	0.128	156.71	10088.64	1	270	4.194	0.042
<u>COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS</u>									
<u>F-TEST TABLE</u>									
<u>GROUPS</u>	<u>YEARS</u>		<u>#</u>	<u>SS</u>		<u>DF</u>			
<u>=====</u>	<u>1978</u>	<u>1979</u>	<u>#</u>	<u>BETWEEN</u>	<u>WITHIN</u>	<u>BETWEEN</u>	<u>WITHIN</u>	<u>F-RATIO</u>	<u>PROB</u>
EARLY	33.23	35.47	#	3227.41	1857493.62	1	2598	4.514	0.034
LATE	39.06	39.35	#	26.05	891021.69	1	1268	0.037	0.847
MALE	33.80	36.59	#	3938.72	1466006.99	1	2030	5.454	0.020
FEMALE	36.16	37.68	#	1129.72	1425325.75	1	1957	1.551	0.213
NORTH	30.75	31.58	#	244.39	1015782.14	1	1439	0.346	0.556
SOUTH	37.36	40.22	#	5182.71	1825507.78	1	2548	7.234	0.007
PUBLIC	34.91	37.21	#	4357.70	2415014.32	1	3290	5.937	0.015
SEPARATE	35.21	36.71	#	391.42	479732.44	1	697	0.569	0.451

FIGURE 135



LEVEL E (Grade 5)

OPERATIONS  
AND PROPERTIES

OBJECTIVE 7    Adds, subtracts and multiplies  
                  decimals to thousandths.

TEST ITEMS

18. Multiply the following:

(a)    0.5  
      x 0.7

(b)    0.25  
      x 3.2

(c) 427.8 x 2.61 =

19. Add the following:

(a)    0.05  
      + 1.96

(b)    19.243  
      + 6.351

(c) 11.040 + 7.591 =

20. Subtract the following:

(a)    1.9  
      - 0.7

(b) 8.63 - 7.29 =

(c) 4.844  
      - 0.369

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR    GRADE:5    STRAND:2    OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS:    1978 N=2129    1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	41.15	32.87	15.36	14.82	30.91	33.30	12.59	19.01
MEAN (%)	23.69	24.75	55.64	55.58	71.18	71.53	91.85	92.09

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
I-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	5.395	3989	0.000	#	403.76	442648.29	1	1486	1.355 0.245
B:	0.472	3989	0.637	#	0.63	553.08	1	601	0.683 0.409
C:	-1.615	3989	0.107	#	40.68	38458.93	1	1276	1.350 0.246
D:	-5.582	3989	0.000	#	8.58	15343.78	1	620	0.347 0.556

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN
								F-RATIO	PROB
EARLY	49.53	57.14	#	37319.86	2098333.09	1	2598	46.207	0.000
LATE	56.85	58.32	#	680.44	859548.51	1	1268	1.004	0.317
MALE	48.22	55.01	#	23345.25	1601346.05	1	2030	29.594	0.000
FEMALE	55.61	60.50	#	11642.19	1429867.88	1	1957	15.934	0.000
NORTH	45.00	54.11	#	29680.69	1262121.86	1	1439	33.840	0.000
SOUTH	55.76	59.70	#	9846.36	1741705.33	1	2548	14.405	0.000
PUBLIC	52.25	57.02	#	18631.88	2551449.15	1	3290	24.025	0.000
SEPARATE	49.97	60.86	#	20654.51	517231.71	1	697	27.833	0.000

FIGURE 136



performances in adding, subtracting and multiplying decimals to thousandths. Even so, only a little over fifty percent of the pupils were above a percentage mean of 65 (categories C and D.

MEASUREMENT (Ten objectives; Figures 37 to 146)

### Hypothesis 1

One objective had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

### Hypothesis 2

Seven objectives had significant increases in the proportion of pupils reaching the 85-100 percent criterion category from 1978 to 1979.

### Findings

About two-thirds of the grade five pupils could read and write time to seconds in at least three out of four examples provided. The same proportion of pupils could read the 24 hour clock with reasonable accuracy.

Drawing 2-dimensional figures to scale was introduced in grade five, however, one-third of the grade five pupils could not calculate scale, at least for the example using  $0.5 \text{ cm} = 1 \text{ m}$ .

Area and volume concepts were not handled well by the students. About forty percent of the pupils did not know how to compute either.

Eighty-seven percent of the 1979 test group received



## LEVEL E (Grade 5)

## MEASUREMENT

## OBJECTIVE 1

Extends use of standard units to include tonnes.

## TEST ITEMS

1. In the blank, write the number of the item which would be approximately 2 m in length.

- (1) a baseball bat
- (2) a truck
- (3) a house
- (4) a bed

2. King Kong can lift 10 Volkswagens with one hand. How great a mass is he lifting? Write the number in the blank.

- (1) one tonne    (2) 10 grams    (3) 40 kilograms    (4) 10 tonnes

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 1

TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	13.95	12.57	38.52	39.80	0.0	0.0	47.53	47.64
MEAN (%)	0.0	0.0	50.00	50.00	*****	*****	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST			
H0: PROPOR78=PROPOR79				SS			
				DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN
A: 1.283	3989	0.200	#	SSW IS EQUAL TO ZERO			
B: -0.827	3989	0.409	#	SSW IS EQUAL TO ZERO			
C: 0.0	3989	1.000	#	TOO FEW PUPILS FOR CALCULATIONS			
D: -0.065	3989	0.948	#	SSW IS EQUAL TO ZERO			

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	F005
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	65.34	66.34	#	648.16	3323735.50	1	2598	0.507	0.477
LATE	69.94	70.07	#	5.06	1391994.94	1	1268	0.005	0.546
MALE	69.04	68.47	#	161.56	2486087.21	1	2030	0.132	0.717
FEMALE	64.47	66.56	#	2123.22	2403269.84	1	1957	1.729	0.189
NORTH	62.21	64.54	#	1950.70	1936057.63	1	1439	1.450	0.229
SOUTH	69.41	69.21	#	26.57	2931272.45	1	2548	0.023	0.879
PUBLIC	67.07	66.25	#	551.54	4074724.13	1	3250	0.445	0.505
SEPARATE	65.45	73.48	#	11254.50	812443.64	1	657	9.655	0.002

FIGURE 137







## LEVEL E (Grade 5)

## MEASUREMENT

**OBJECTIVE 3** Reads the 24 hour clock.

## TEST ITEMS

4. Write the number of the best answer on the blank.

A. On a 24 hour clock, 0900 would be

(1) 9:00 a.m. (2) 9:00 p.m. (3) 12:09 p.m. A. \_\_\_\_\_

B. If the same clock read 1500, the time would be

(1) 12:15 p.m. (2) 3:00 a.m. (3) 3:00 p.m. B. \_\_\_\_\_

C. 2400 would be

(1) 12:00 noon (2) 12:00 midnight (3) none of these

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATAGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	39.69	36.09	0.0	0.0	25.65	27.18	34.66	36.73
MEAN (%)	20.36	19.44	*****	*****	66.67	66.67	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 PUPILS									
PROPORTION TEST				F-TEST					
H0: PRCPOR78=PRCPOR79				SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A: 2.337	3989	0.019	#	310.37	404708.31	1	1515	1.162	0.281
B: 0.0	3989	1.000	#	<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>					
C: -1.094	3989	0.274	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
D: -1.363	3989	0.174	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	57.07	60.07	#	5775.65	3476425.63	1	2598	4.316	0.038
LATE	66.37	65.26	#	389.38	1455436.51	1	1268	0.339	0.560
MALE	60.17	61.02	#	366.50	2628408.65	1	2030	0.283	0.595
FEMALE	59.50	62.76	#	5156.36	2523437.60	1	1957	3.999	0.046
NORTH	52.63	54.37	#	1091.88	1959959.86	1	1439	0.802	0.371
SOUTH	63.96	66.05	#	2779.97	3071850.10	1	2548	2.306	0.129
PUBLIC	59.41	62.64	#	8537.41	4233682.11	1	3290	6.634	0.010
SEPARATE	61.88	58.28	#	2252.85	912790.86	1	657	1.720	0.190

FIGURE 139







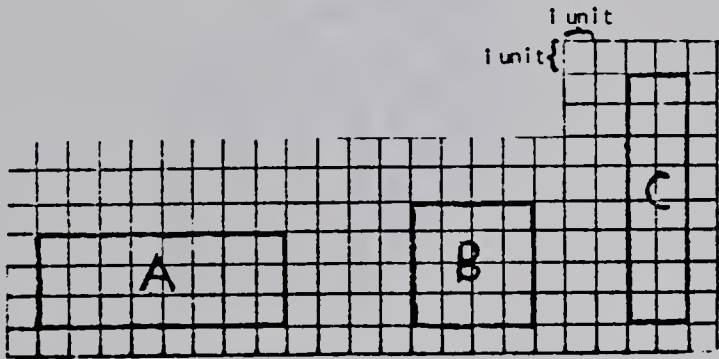
LEVEL E (Grade 5)

MEASUREMENT

OBJECTIVE 5 Finds area of regular polygons without using formulae.

TEST ITEMS

6. Find the area of rectangles A, B, and C. Write the area on the blanks at the side.



A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATAGCRY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	49.22	40.33	0.0	0.0	27.24	30.24	23.53	29.43
MEAN (%)	3.69	5.28	*****	*****	66.67	66.67	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	5.632	3989	0.000	#	1109.20	225893.46	1	1797	8.824 0.003
B:	0.0	3989	1.000	#	<<<<<<<< TOO FEW PUPILS FOR CALCULATIONS >>>>>>>>				
C:	-2.087	3989	0.037	#	<<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>>				
D:	-4.223	3989	0.000	#	<<<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>>				

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----									
-----F-TEST TABLE-----									
GROUPS	YEARS		#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	41.97	49.29	#	34480.01	4402887.08	1	2598	20.346	0.000
LATE	46.77	55.71	#	25210.87	2175321.94	1	1268	14.695	0.000
MALE	41.22	50.91	#	47520.66	3402465.67	1	2030	28.352	0.000
FEMALE	45.88	52.56	#	21758.96	3404844.18	1	1957	12.506	0.001
NORTH	43.15	48.43	#	9962.61	2520110.64	1	1439	5.689	0.017
SOUTH	43.71	53.56	#	61506.41	4288576.82	1	2548	36.543	0.000
PUBLIC	43.39	50.70	#	43720.34	5581251.64	1	3290	25.772	0.000
SEPARATE	44.08	56.46	#	26706.22	1229679.09	1	657	15.137	0.000

FIGURE 141



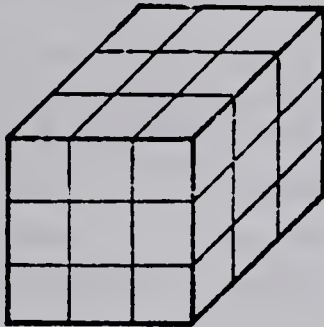
## LEVEL E (Grade 5)

## MEASUREMENT

**OBJECTIVE 6** Finds volume of rectangular solids without using formulae.

## TEST ITEMS

7. What is the volume of the following figure? Each cube is  $1 \text{ cm}^3$ . Write your answer on the blank.



Volume = \_\_\_\_\_

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 6  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	43.21	36.41	29.97	32.38	0.0	0.0	26.82	31.20
MEAN (%)	0.0	0.0	50.00	50.00	*****	*****	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST				F-TEST					
	HO: PRCPOR78=PRCPOR79	#			SS	DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	4.374	3989	0.000	#	<<<<<<<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>>>>>>>			
B:	-1.646	3989	0.100	#	<<<<<<<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>>>>>>>			
C:	0.0	3989	1.000	#	<<<<<<<<<<<<<<<<<<	TOO FEW PUPILS FOR CALCULATIONS	>>>>>>>>>>>>>>>>>>			
D:	-3.048	3989	0.002	#	<<<<<<<<<<<<<<<<<<	SSW IS EQUAL TO ZERO	>>>>>>>>>>>>>>>>>>			

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE-SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE						
	1978	1979		#	SS		DF		F-RATIO	PROB
					BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	40.79	45.86	#	16549.20	4323835.42	1	2598	9.944	0.002	
LATE	44.53	49.58	#	8041.53	2157173.04	1	1268	4.727	0.030	
MALE	39.56	47.26	#	30045.07	3334871.27	1	2030	18.289	0.000	
FEMALE	44.13	47.53	#	5657.25	3373324.37	1	1957	3.282	0.070	
NORTH	37.02	43.85	#	16749.67	2341803.42	1	1439	10.292	0.001	
SOUTH	44.54	49.37	#	14835.96	4336616.00	1	2548	8.717	0.003	
PUBLIC	40.71	46.54	#	27841.00	5427276.71	1	3290	16.877	0.000	
SEPARATE	47.02	51.36	#	3288.33	1273607.23	1	697	1.800	0.180	

FIGURE 142







## LEVEL E (Grade 5)

## MEASUREMENT

Understands the system of metric prefixes, including use of symbols.

## OBJECTIVE 8

kilo hecto deca Basic Unit deci centi milli

## TEST ITEMS

10. Give the value of the following prefixes; e.g., hundred, tens, tenths. Write the prefix symbol.

	<u>Value</u>	<u>Symbol</u>
(1) kilo	- _____	_____
(2) deci	- _____	_____
(3) milli	- _____	_____
(4) hecto	- _____	_____
(5) centi	- _____	_____
(6) deca	- _____	_____

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 8

TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	45.70	38.94	15.74	17.35	20.62	21.75	17.94	21.97
MEAN (%)	8.27	8.64	50.00	50.00	73.88	74.32	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
H0: PROPOR78=PROPOR79	#			SS		DF			
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FEOF
A: 4.313	3989	0.000	#	56.97	257843.34	1	1696	0.375	0.541
B: -1.369	3989	0.171	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C: -0.873	3989	0.383	#	40.96	57873.73	1	842	0.596	0.440
D: -3.181	3989	0.002	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	42.27	49.08	#	29782.81	3655139.30	1	2598	21.169	0.000
LATE	50.74	51.55	#	206.00	1787935.95	1	1268	0.146	0.702
MALE	40.82	47.68	#	23838.31	2803712.00	1	2030	17.260	0.000
FEMALE	48.97	52.76	#	7016.96	2809156.55	1	1957	4.888	0.027
NORTH	40.46	43.78	#	3942.51	2064303.69	1	1439	2.748	0.098
SOUTH	47.32	53.74	#	26165.68	3530228.66	1	2548	18.885	0.000
PUBLIC	44.66	49.08	#	15973.77	4741540.99	1	3290	11.084	0.001
SEPARATE	45.62	55.25	#	16167.86	907979.33	1	697	12.411	0.000

FIGURE 144



LEVEL E (Grade 5)

MEASUREMENT

OBJECTIVE 9

Expresses equivalent measures within units of length, mass and capacity.  
e.g. 1 m + 4 dm + 2 cm =  
1.42 m, 14.2 dm, or 142 cm

TEST ITEMS

11. A barrel of gas has a capacity of 190 litres.
- This is \_\_\_\_\_ millilitres.
12. Wolfman Jack has 3 467 kilograms of cobwebs in his house.
- This is \_\_\_\_\_ grams.
- This is \_\_\_\_\_ tonnes.
13. Jane walks 3 000 millimetres from her desk to her book shelf.
- She walks \_\_\_\_\_ metres.
- She walks \_\_\_\_\_ centimetres.
- She walks \_\_\_\_\_ decimetres.
- She walks \_\_\_\_\_ kilometres.

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND:3 OBJECTIVE: 9  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	77.31	73.04	8.17	9.08	5.78	7.04	8.74	10.25
MEAN (%)	13.35	15.88	57.14	57.14	71.43	71.43	92.24	92.72

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	3.124	3989	0.002	#	4781.73	844066.43	1	3004	17.018	0.000
B:	-1.016	3989	0.310	#	0.00	0.00	1	341	48.714	0.000
C:	-1.624	3989	0.105	#	0.00	0.00	1	252	7.200	0.008
D:	-2.247	3989	0.025	#	21.66	19721.66	1	386	0.424	0.515

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978		1979				
			#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	25.52	29.51	#	10246.65	2364856.65	1	2598	11.257	0.001
LATE	31.06	35.49	#	6186.91	1240720.53	1	1268	6.323	0.012
MALE	27.49	32.74	#	13932.39	1950207.80	1	2030	14.502	0.000
FEMALE	26.85	30.97	#	8256.93	1819626.31	1	1957	8.880	0.003
NORTH	24.12	26.41	#	1870.46	1333401.24	1	1439	2.019	0.156
SOUTH	28.92	34.92	#	22859.34	2395764.42	1	2548	24.312	0.000
PUBLIC	27.48	32.03	#	16996.02	3159143.04	1	3290	17.700	0.000
SEPARATE	25.75	31.13	#	5042.82	611226.49	1	697	5.750	0.017

FIGURE 145







100 percent scores on the concept of perimeter.

Confusion in the Metric System still appears to exist. Although two-thirds of the students could identify the appropriate standardized measuring units for given measurement situations, less success was experienced in other objectives. Only one student in five showed complete understanding of the values assigned to the metric prefixes as well as the use of symbols.

Seventy percent of the grade five pupils could not express equivalent measures within units of length, mass and capacity. All but twelve percent of the pupils could choose a suitable referant for either or both the metre and the tonne.

## GEOMETRY (Four objectives; Figures 147 to 150)

### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent criterion category.

### Hypothesis 2

All four objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level from 1978 to 1979.

### Findings

The students in 1979 demonstrated better understanding of motion geometry than the 1978 group. Over three-quarters of the grade five's could test the congruency of polygons



LEVEL E (Grade 5)

GEOMETRY

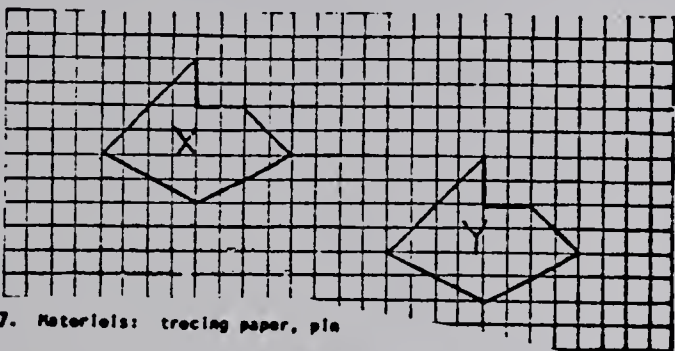
OBJECTIVE 1

Tests congruency of polygons using motion geometry (slides, flips and turns).

TEST ITEMS

15. Choose the best underlined answer and write it on the blank.

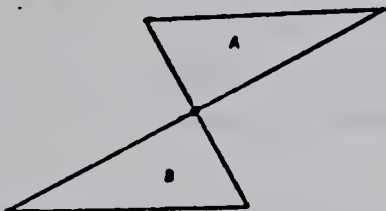
Polygon X is the flip, slide, turn image of Y.



17. Materials: tracing paper, pin

Write the correct underlined answer on the blank.

Polygon A is the flip, slide, turn image of B.

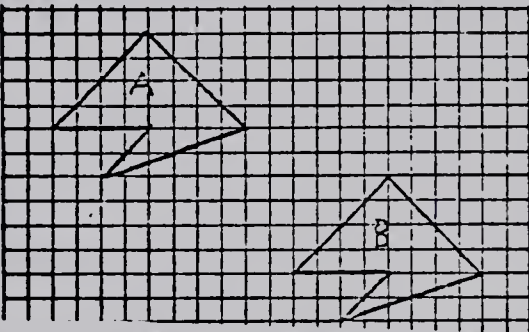


16. Materials: onion skin paper, pencil

Directions: Trace Polygon A to check if Polygon A and B are congruent.

Write the correct underlined answer on the blank.

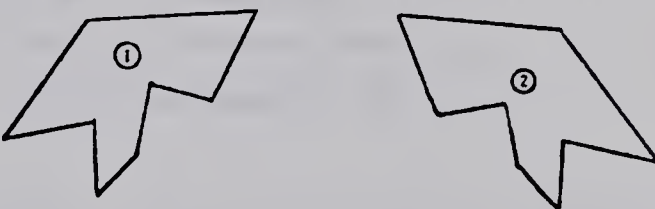
Polygon A is, is not congruent to Polygon B.



18. Materials: onion skin tracing paper, pencil, pin

Write the best answer on the blank.

Polygon ① is the flip, slide, turn image of ②



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR GRADE:5 STRAND:4 OBJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBEP(X)	19.63	14.77	7.89	6.98	32.79	32.17	39.69	46.08
MEAN (X)	15.61	18.12	50.05	50.06	74.87	75.28	99.93	99.97

TABLES CCMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	4.047	3989	0.000	#	1045.99	170687.62	1	691	4.234	0.040
B:	1.090	3989	0.276	#	0.02	137.94	1	296	0.033	0.856
C:	0.414	3989	0.679	#	54.08	89733.25	1	1255	0.780	0.377
D:	-4.071	3989	0.000	#	0.68	689.69	1	1701	1.671	0.196

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	69.72	75.18	#	19141.93	2593624.07	1	2598	19.174	0.000
LATE	74.57	79.15	#	6620.48	1099960.89	1	1268	7.632	0.006
MALE	69.62	76.52	#	24037.70	2058001.03	1	2030	23.711	0.000
FEMALE	72.87	76.39	#	6018.84	1773026.24	1	1957	6.643	0.010
NORTH	64.59	67.93	#	3996.21	1785040.33	1	1439	3.222	0.073
SOUTH	75.01	81.21	#	24417.60	1922545.94	1	2548	32.361	0.000
PUBLIC	71.71	75.81	#	13744.56	3166864.70	1	3250	14.279	0.000
SEPARATE	68.88	79.44	#	19443.23	663757.38	1	657	20.417	0.000

FIGURE 147







## LEVEL E (Grade 5)

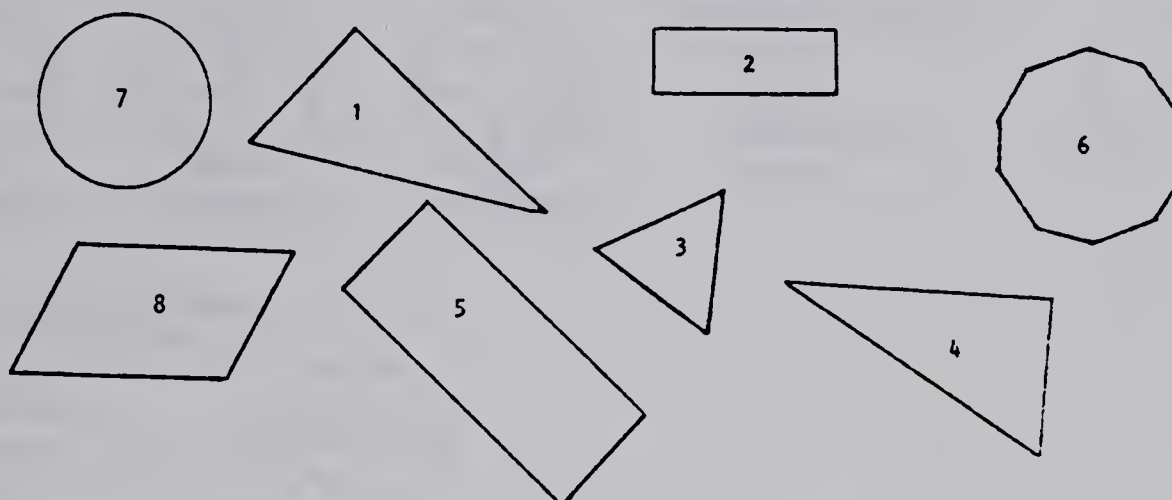
## GEOMETRY

### OBJECTIVE 3

Distinguishes 2-dimensional figures as similar or congruent.

## TEST ITEMS

20. Look at the figures below. Fill in the blanks.



Figures \_\_\_\_\_ and \_\_\_\_\_ are congruent.

Figures                      and                      are similar.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:5 STRAND:4 OBJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	19.49	13.96	34.57	30.02	0.14	0.11	45.80	55.91
MEAN (%)	1.60	1.35	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
PROPORTION TEST				F-TEST						
H0: PRCPOR78=PROPOR79				SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	4.649	3989	0.000	#	10.01	27377.49	1	673	0.246	0.620
B:	3.062	3989	0.002	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
C:	0.298	3989	0.765	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					
D:	-6.374	3989	0.000	#	<<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
	1978	1979		SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	62.34	69.27	#	30915.11	3676363.20	1	2598	21.847	0.000
LATE	67.08	73.63	#	13565.36	1566723.02	1	1268	10.979	0.001
MALE	60.86	70.17	#	43860.09	2900716.60	1	2030	30.694	0.000
FEMALE	66.22	72.25	#	17665.25	2516519.76	1	1957	13.738	0.000
NORTH	58.11	65.61	#	20172.27	2403609.39	1	1439	12.077	0.001
SOUTH	66.58	74.30	#	37860.80	2963291.16	1	2548	32.555	0.000
PUBLIC	64.09	69.85	#	27179.78	4553217.92	1	3290	19.639	0.000
SEPARATE	60.67	77.39	#	48675.31	862354.73	1	697	39.342	0.000

FIGURE 149



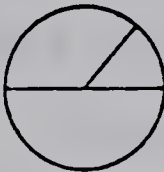
LEVEL E (Grade 5)

GEOMETRY

OBJECTIVE 4 Identifies radius, diameter and circumference.

TEST ITEMS

21. On each circle use a red crayon to trace



(a) the circumference



(b) the diameter

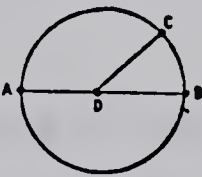


(c) the radius

23. Write the best answer on the blank:

BC on the circle below is the

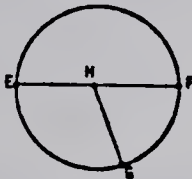
- (a) diameter
- (b) polygon
- (c) circumference
- (d) radius



22. Write the best answer on the blank:

EF on the circle below is the

- (a) diagonal
- (b) circumference
- (c) diameter
- (d) radius



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.

CRITERION CATEGORIES FOR GRADE:5 STRAND:4 OBJECTIVE: 4

TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	51.62	45.27	6.25	7.84	7.00	6.87	35.13	40.01
MEAN (%)	15.90	16.68	57.14	57.14	71.43	71.43	98.22	98.77

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PRCPOR78=PRCPOR79			SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	4.002	3989	0.000	#	288.44	512127.65	1	1940	1.093 0.296
B:	-1.970	3989	0.049	#	0.0	0.00	1	277	0.0 1.000
C:	0.154	3989	0.878	#	0.0	0.00	1	275	0.0 1.000
D:	-3.176	3989	0.002	#	112.47	28559.02	1	1451	5.872 0.016

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978		1979				
			#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
EARLY	49.05	55.02	#	22959.83	4127111.67	1	2598	14.453	0.000
LATE	56.74	58.20	#	674.67	1973306.53	1	1268	0.434	0.510
MALE	49.42	54.93	#	15376.06	3178156.00	1	2030	9.821	0.002
FEMALE	53.21	58.05	#	11409.32	3136549.14	1	1957	7.119	0.008
NORTH	42.99	47.23	#	6440.86	2277662.02	1	1439	4.069	0.044
SOUTH	56.03	61.61	#	19832.05	3876868.71	1	2548	13.034	0.000
PUBLIC	50.41	56.97	#	35245.05	5239049.78	1	3250	22.133	0.000
SEPARATE	55.48	54.11	#	324.86	1077783.81	1	657	0.210	0.647

FIGURE 150



using slides, flips and turns in at least three of the four items utilized. Also less than fifteen percent of the pupils could not distinguish between similar and congruent figures.

Almost one-half of the zone pupils could not identify corresponding sides and angles, yet one-third of the sample could respond with 98 percent accuracy.

Significantly more pupils in 1979 could identify the radius, diameter, and circumference in circles than in 1978. Still only forty percent of the Zone group could name all three.

#### GRAPHING (Five objectives; Figures 151 to 155)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

##### Hypothesis 2

All five objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

##### Findings

Two-thirds of the grade five pupils could interpret and solve problems involving the bar and line graphs within the achievement range of categories C and D (65-100 percent).

One-third of the pupils could not achieve any success with constructing line and pictographs. About half of the students could construct both with fair accuracy (65-100

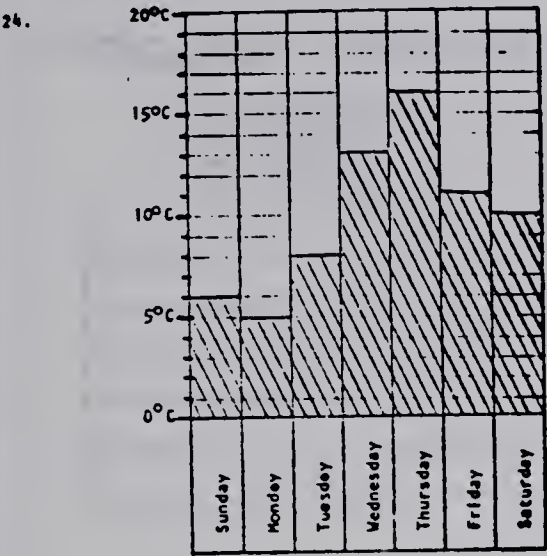


LEVEL E (Grade 5)

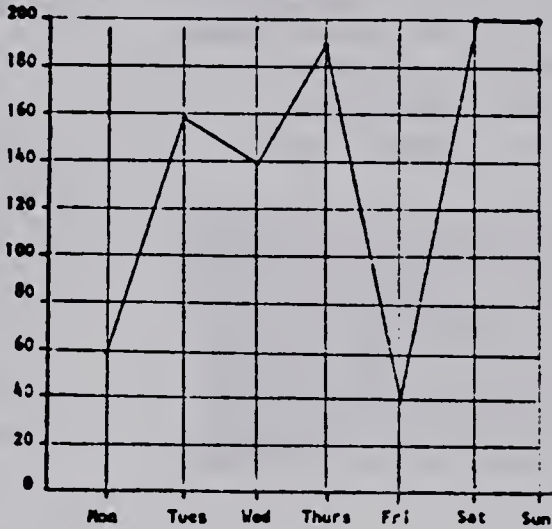
GRAPHING

OBJECTIVE 1 *Interprets and solves problems using data collected from line, bar and pictographs.*

TEST ITEMS



25. Below is a graph showing how many ice-cream cones a store sold during last week. Examine it and answer the questions below.



On what day were 190 cones sold?  
\_\_\_\_\_  
On what day were the least number of cones sold?  
\_\_\_\_\_  
How many were sold on that day?  
\_\_\_\_\_

- (a) The difference between the highest and lowest temperature is \_\_\_\_\_ C.  
(b) The two warmest days were \_\_\_\_\_ and \_\_\_\_\_.

25 One additional item used

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATAGORY A-D.  
CRITERION CATEGORIES FOR GRADE:5 STRAND:5 OJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	28.42	22.23	13.15	13.27	20.06	19.28	38.37	45.22
MEAN (%)	21.43	22.79	55.56	55.56	70.57	70.32	94.00	94.37

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	4.469	3989	0.000	#	450.18	297022.05	1	1017	1.541 0.215
B:	-0.106	3989	0.916	#	0.0	0.00	1	525	0.0 1.000
C:	0.615	3989	0.539	#	12.29	21792.75	1	784	0.442 0.506
D:	-4.378	3989	0.000	#	54.58	51038.82	1	1657	1.772 0.183

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN
EARLY	61.06	66.44	#	18648.72	2514626.45	1	2598	15.267	0.000
LATE	70.15	72.46	#	1687.34	996246.85	1	1268	2.148	0.143
MALE	61.92	67.84	#	17691.87	2012371.07	1	2030	17.847	0.000
FEMALE	65.38	69.53	#	8383.15	1690550.93	1	1957	9.704	0.002
NORTH	56.27	61.14	#	8471.70	1691051.44	1	1439	7.209	0.007
SOUTH	67.82	72.87	#	16165.34	1894942.67	1	2548	21.736	0.000
PUBLIC	63.57	67.31	#	11449.98	3120667.80	1	3290	12.071	0.001
SEPARATE	63.87	74.95	#	21398.96	574096.19	1	697	25.980	0.000

FIGURE 151



## LEVEL E (Grade 5)

## GRAPHING

**OBJECTIVE 2** Constructs line, bar and pictographs.

## TEST ITEMS

27. Construct a pictograph that shows how many boxes of apples each farm produced last year. Let each box contain 100 apples.

Farm A = 800 apples  
Farm B = 900 apples  
Farm C = 450 apples  
Farm D = 700 apples  
Farm E = 300 apples


28. On the grid paper below, construct a line graph that will give this information:

Number of cars sold at Bing's Used Car Lot in a six month period.

January - 40 cars	April - 30 cars
February - 20 cars	May - 60 cars
March - 50 cars	June - 20 cars

A full page of blank graph paper with a uniform grid of small squares. The grid covers most of the page, leaving margins at the top, bottom, and sides. There are approximately 20 columns and 25 rows of squares.

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:5 STRAND:5 OBJECTIVE: 2

**TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862**

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	47.35	33.46	13.20	14.39	26.54	33.40	12.92	18.74
MEAN (%)	10.43	13.40	50.00	50.00	76.43	76.93	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
MC:	PRCPOR78=PROPOR79	#		SS	DF					
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	8.903	3989	0.000	#	3395.60	341141.15	1	1629	16.214	0.000
B:	-1.093	3989	0.275	#	<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>>					
C:	-4.734	3989	0.000	#	73.60	78958.98	1	1125	1.105	0.294
D:	-5.056	3989	0.000	#	<<<<<<<<<< SSW IS EQUAL TC ZERO >>>>>>>>>>>>					

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE						
	1978	1979		#	SS		DF		E-RATIO	PROB
					BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	42.13	53.24	#	79435.90	3358756.83	1	2598	61.444	0.000	
LATE	50.94	60.40	#	28310.82	1520279.73	1	1268	23.613	0.000	
MALE	41.81	54.18	#	77406.31	2587444.41	1	2030	60.730	0.000	
FEMALE	47.77	58.15	#	52508.87	2495880.61	1	1957	41.172	0.000	
NORTH	39.15	50.10	#	42977.61	1937719.43	1	1439	31.916	0.000	
SOUTH	47.93	59.48	#	84714.88	3096173.58	1	2548	69.716	0.000	
PUBLIC	43.70	55.20	#	108272.99	4219054.11	1	3290	84.431	0.000	
SEPARATE	49.68	60.40	#	20020.26	872298.13	1	657	15.997	0.000	

FIGURE 152







LEVEL E (Grade 5)

GRAPHING

OBJECTIVE 4 Generates ordered pairs from a given relationship.

TEST ITEMS

30. Fill in the blanks:

If 2 candies cost 9¢, 4 candies cost \_\_\_\_\_  
and 10 candies cost \_\_\_\_\_

Write ordered pairs for each of the relationships above. The first is done for you.

(2, 9)  
\_\_\_\_\_  
\_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR GRADE:5 STRAND:5 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	47.77	43.23	25.46	24.81	3.38	4.67	23.39	27.28
MEAN (%)	6.56	6.93	50.00	50.00	75.00	75.00	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST		
HO: PROPOR78=PROPOR79	#	SS	DF		
T-CALC	DF	PROB	#	BETWEEN	WITHIN
A:	2.870	3989	0.004	#	58.90 223829.69
B:	0.469	3989	0.639	#	SSW IS EQUAL TO ZERO
C:	-2.080	3989	0.038	#	SSW IS EQUAL TO ZERO
D:	-2.824	3989	0.005	#	SSW IS EQUAL TO ZERO

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE					
GROUPS	YEARS	#	SS	DF	
=====	1978	1979	#	BETWEEN	WITHIN
EARLY	39.18	44.71	#	19679.36	3973792.75
LATE	48.15	48.52	#	43.47	1888275.92
MALE	41.84	46.76	#	12241.73	3038068.31
FEMALE	41.74	45.59	#	7218.55	3041397.45
NORTH	34.72	40.44	#	11722.05	2120909.81
SOUTH	45.83	49.39	#	8061.39	3864126.11
PUBLIC	41.36	46.52	#	21812.11	5010843.38
SEPARATE	43.83	44.62	#	107.77	1066426.57

FIGURE 154







percent).

About seven pupils in ten could give the coordinates for points on a grid. Slightly less than one-half of this group could do so with 100 percent accuracy, however. The increase in performance on this skill was highly significant for all subgroups.

Although three-quarters of the grade five pupils could graph ordered pairs from a given relationship less than one-third of the students could generate equivalent sets of ordered pairs when given one (Figure 154).

#### **A. DISCUSSION OF THE GRADE FIVE RESULTS**

Tables 17 to 19 indicate a somewhat low performance for the grade five pupils. As previously noted the achievement means for objectives within each of the strands vary greatly.

##### Number

Table 18 reveals a rather high proportion of students who are achieving within category A (Below 50) at the grade five level.

It is redundantly clear that the place value problems persist even to the grade five level. Even though the one test item in Figure 126 goes beyond the objective it, and those items in Figures 125 and 129, indicate that pupils have problems with the terminology associated with place value. The one item asks pupils to give the numeral that was provided in a named place value location. The other required



TABLE 17  
THE 1978 AND 1979 ZONE ONE MEAN SCORES FOR GRADE  
FIVE BY OBJECTIVES AND STRAND

ZONE ONE		GRADE FIVE		JUNE/78	
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT	GEOMETRY      GRAPHING
1	59.4%	1	78.0%	1 66.8%	1 71.2%      1 63.6%
2	70.0%	2	66.3%	2 66.5%	2 38.2%      2 44.7%
3	36.4%	3	45.5%	3 59.8%	3 63.5%      3 53.2%
4	40.2%	4	53.8%	4 48.5%	4 51.3%      4 41.8%
5	46.6%	5	76.6%	5 43.5%	5 68.8%
6	38.1%	6	35.0%	6 41.8%	
		7	51.9%	7 73.9%	
				8 44.8%	
				9 27.2%	
				10 82.0%	
<hr/>					
AVG	48.5%		58.1%	55.5%	56.0%      54.4%

ZONE ONE		GRADE FIVE		JUNE/79	
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT	GEOMETRY      GRAPHING
1	66.0%	1	80.6%	1 67.5%	1 76.5%      1 68.7%
2	75.0%	2	68.1%	2 69.7%	2 45.6%      2 55.1%
3	43.5%	3	48.0%	3 61.9%	3 71.2%      3 66.7%
4	43.4%	4	55.3%	4 59.3%	4 56.5%      4 46.2%
5	47.2%	5	72.7%	5 51.7%	
6	42.8%	6	37.1%	6 47.4%	
		7	57.7%	7 78.3%	
				8 50.2%	
				9 31.9%	
				10 88.0%	
<hr/>					
AVG	53.0%		59.9%	60.6%	63.4%      63.0%

the naming of a place value position (eg. thousands). Two thirds of the pupils could do neither.



TABLE 18

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	51.01	45.76	19.68	19.87	19.92	21.75	9.39	12.62
MEAN (X)	27.31	30.14	57.26	57.12	73.44	74.02	91.85	93.10

TABLES CCMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	3.312	3989	0.001	#	3818.29	407377.75	1	1936	18.146	0.000
B:	-0.151	3989	0.880	#	3.73	14288.34	1	787	0.205	0.651
C:	-1.426	3989	0.154	#	70.13	27421.03	1	827	2.115	0.146
D:	-3.263	3989	0.001	#	169.36	9832.32	1	433	7.458	0.007

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	32.97	29.81	23.30	25.19	34.81	34.05	8.92	10.96
MEAN (X)	33.14	34.52	57.48	57.54	74.13	74.22	89.74	90.15

TABLES CCMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB	
A:	2.149	3989	0.032 #	591.23	181164.58	1	1255	4.096	0.043	
B:	-1.392	3989	0.165 #	0.80	15563.78	1	963	0.049	0.824	
C:	0.501	3989	0.617 #	2.70	43515.97	1	1373	0.085	0.771	
D:	-2.147	3989	0.032 #	17.07	5440.76	1	392	1.230	0.268	

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:5 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	39.41	29.43	22.69	24.54	27.99	32.49	9.91	13.53
MEAN (X)	32.50	34.09	57.32	57.81	73.90	73.82	90.64	91.46

TABLES CCMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PROPOR79				SS		DF				
	T-CALC	DF	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	6.604	3989	0.000	#	842.34	241112.53	1	1385	4.839	0.028
B:	-1.379	3989	0.168	#	55.64	15675.63	1	938	3.330	0.068
C:	-3.090	3989	0.002	#	1.86	38353.90	1	1199	0.058	0.810
D:	-3.566	3989	0.001	#	76.73	8795.99	1	461	4.021	0.046



TABLE 19

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE GEOMETRY AND GRAPHING STRANDS

<u>ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D</u>									
CRITERION CATEGORIES FOR GRADE:5 STRAND: GEOMETRY									
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862									
	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%		
	1978	1979	1978	1979	1978	1979	1978	1979	
NUMBER (%)	39.88	30.72	19.07	17.72	22.55	28.20	18.51	23.36	
MEAN (%)	27.68	30.32	57.17	57.32	74.01	74.45	94.05	93.92	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	6.028	3989	0.000	#	2372.08	339927.89	1	1419	9.902 0.002
B:	1.095	3989	0.274	#	3.67	14845.88	1	734	0.181 0.670
C:	-4.102	3989	0.000	#	58.18	30246.48	1	1003	1.929 0.165
D:	-3.772	3989	0.000	#	6.02	23861.36	1	827	0.209 0.648
<u>ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D</u>									
CRITERION CATEGORIES FOR GRADE:5 STRAND: GRAPHING									
TOTAL NUMBER OF PUPILS: 1978 N=2129 1979 N=1862									
	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%		
	1978	1979	1978	1979	1978	1979	1978	1979	
NUMBER (%)	39.55	26.96	17.38	17.72	27.20	32.01	15.88	23.31	
MEAN (%)	24.11	26.57	57.87	58.04	74.23	74.87	92.28	92.42	
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	8.395	3989	0.000	#	1915.90	385777.14	1	1342	6.665 0.010
B:	-0.285	3989	0.776	#	5.12	12657.11	1	658	0.282 0.596
C:	-3.328	3989	0.001	#	119.20	37671.91	1	1173	3.712 0.054
D:	-5.930	3989	0.000	#	3.67	16346.37	1	770	0.173 0.678



It would appear from the two rounding items that grade five pupils have difficulty identifying the tenths and hundredths positions in numbers. This is evidenced by the fact that the rounding of whole numbers has a significantly better achievement picture than did the rounding of decimals.

Pupils do not appear to have the background that is required for success with proportional ratios. While the basic multiplication facts are involved and perhaps cause a part of the difficulty the amount of time devoted to the topic of ratios is probably as much or more to blame for the low achievement. The currently authorized textbooks give little coverage to the topic of ratios either.

#### Operations and Properties

The majority of the grade five group had some success with the addition, subtraction and multiplication whole number algorithms. At least two thirds of the students achieved above the 65 percent level. As expected the operations with decimals were less well done. About one third of the pupils achieved within the below 50 category.

The grade five basic facts test was the most extensive of the six grades. The fact that less than fifty percent of the pupils reach the mastery category (85-100 percent) on the facts likely has an influence on achievement.

It is informative to examine the word problems used in Figure 135 to see where some of the difficulties lie with the problem solving objective. Two of the items use the



multiplication and division operations in which many pupils experience frustrations. Another of the word problems required the dual use of the addition and subtraction operations. Still the achievement picture for this topic has not been bright, at least to the grade five level.

The items used to test how well students can divide whole numbers using one and two digit divisors had a wide range of difficulty. If the items are in fact representative of what children know, then it is disappointing to note that less than half of the pupils could effectively handle the operation when it has existed in some form of the program since grade two.

### Measurement

The results from Tables 17 and 18 would suggest that the grade five measurement strand is somewhat heavy. Many of the ten objectives represent new material which, when added to previously unmastered objectives in the measurement sequence, spell frustration. These new concepts include the 24-hour clock, scale drawings, volume and the metric prefixes, symbols and equivalent measures within units.

The primary weakness in the measurement strand, as at grade four is, still the metric system. Students in grade four for example, could not identify equivalent measures of capacity and the grade five performance shows little improvement. The difficulty, as the evidence from Figure 144 perhaps suggests, is that students do not know the metric prefix values. Since this is a basic recall item it may be



that little time is devoted to the topic. Grade five students did have improved success with knowing which are the appropriate units to use in measurement situations however.

The proportions of students within category D for scale items in 1979 would suggest that more time is being devoted to this concept. The one item used to test drawing to scale requires that pupils understand the 0.5 cm notation and thus may be checking as much for knowledge of decimal notation and the centimetre as it does of scale.

The volume objective called for work with rectangular solids. The items in Figure 142 test student recall of the solid since there are hidden sides. This may be valid although the test item appears more difficult than the objective. Still about two-thirds of the pupils could find the volume of a cube.

For a new topic the 24-hour clock is handled well. Also grade five pupils have more success with the reading and writing of time, an indication perhaps that more children at this level have watches.

### Geometry

The improved achievement in geometry from 1978 to 1979 for all objectives may be a reflection of the increased attention given this strand.

Some students appeared to confuse the concepts of similarity and congruency. The grade four items checked for knowledge of congruent figures only and students did much



better on them.

The naming of corresponding sides in figures was first introduced in grade three. Since student performance on corresponding sides in grade three showed low achievement, similar to that in grade five the treatment of this concept should perhaps be reviewed.

The items used to test pupil recall of the terms radius, diameter and circumference may be a reflection of the time and importance allotted to the concept.

### Graphing

The difficulty grade five pupils have in constructing graphs appears to be with the developing of scale. This is supported by the achievement scores by grade four pupils who were provided a scale with which to construct their graph. Students may also be experiencing difficulties with the visualizing of the graphing problems; perhaps they represent an extension or a part of the world of problem solving within which it appears that pupils fail.

Although the mathematics objectives have supposidly involved students in the reading, writing and graphing of ordered pairs since grade three, it appears as though they are still not able to write or generate such number pairs with any consistency.



## CHAPTER IX

### GRADE SIX

#### ANALYSIS OF HYPOTHESIS ONE AND TWO FOR GRADE SIX

NUMBER (Seven objectives; Figures 158 to 164)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement level.

##### Hypothesis 2

All seven objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

##### Findings

The grade six mean score for each of the place value objectives, including the rounding of numerals and expanded notation was in the 50 and low 60 percent range; however, more than one-third of the pupils failed to show a reasonable understanding of the concepts involved.

About thirty percent of the students could express halves, quarters and fifths as common fractions or decimals with complete accuracy. The achievement figures for over one-half of the Zone One pupils were within the lower A and B categories on this skill.

Close to eight of every ten pupils could identify and order integers. The mean score for performance on this skill



PART I

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
1	1	Number	1	10
1	2	Number	2	10
1	3	Number	3	12
1	4	Number	4	4
1	5	Number	4	4
1	6	Number	4	6
1	7	Number	5	6
1	8	Number	5	5
1	9	Number	6	12
1	10	Number	7	12

1	11	Operations & Properties	1	8
1	12	Operations & Properties	2	8
1	13	Operations & Properties	3	6
1	14	Operations & Properties	4	8
1	15	Operations & Properties	5	8
1	16	Operations & Properties	6	8
1	17	Operations & Properties	8	1
1	18	Operations & Properties	8	1
1	19	Operations & Properties	8	1
1	20	Operations & Properties	8	1
1	21	Operations & Properties	8	1
1	22	Operations & Properties	8	1
1	23	Operations & Properties	8	1
1	24	Operations & Properties	8	1
1	25	Operations & Properties	7	10

FIGURE 156  
GRADE SIX DETAILED ANALYSIS OF MARK WEIGHTINGS



PART II

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
II	1	Measurement	1	6
II	2	Measurement	2	3
II	3	Measurement	2	3
II	4	Measurement	3	3
II	5	Measurement	3	3
II	6	Measurement	4	5
II	7	Measurement	5	3
II	8	Measurement	5	3
II	9	Measurement	6	8
II	10	Measurement	7	4
II	11	Measurement	7	4

II	12	Geometry	1	12
II	13	Geometry	2	2
II	14	Geometry	2	2
II	15	Geometry	2	2
II	16	Geometry	2	2
II	17	Geometry	2	2
II	18	Geometry	2	2
II	19	Geometry	3	12
SUB - TOTAL = 36				
II	20	Graphing	1	12
II	21	Graphing	2	12

FIGURE 157  
GRADE SIX DETAILED ANALYSIS OF MARK WEIGHTINGS



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 1 Expresses halves, quarters and fifths as fractions or decimals.

TEST ITEMS

1. A. Change the following to decimal fractions:
- a.  $\frac{1}{2}$
  - b.  $\frac{3}{4}$
  - c.  $\frac{4}{5}$
- B. Change the following to common fractions:
- a. 0.25
  - b. 0.40

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D										
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 OBJECTIVE: 1										
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668										
A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%				
1978		1979		1978		1979		1978		
NUMBER (%)	50.71	37.95	13.02	13.85	12.18	16.31	24.09	31.89		
MEAN (%)	16.80	17.25	58.26	58.35	78.05	78.16	98.25	99.04		
TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS										
PROPORTION TEST			F-TEST							
HO: PROPOR78=PROPOR79			SS		DF					
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EEOR	
A:	7.647	3563	0.000	#	78.29	501555.94	1	1593	0.249	0.618
B:	-0.724	3563	0.469	#	1.10	6726.31	1	476	0.078	0.781
C:	-3.534	3563	0.001	#	1.51	7704.26	1	501	0.098	0.754
D:	-5.193	3563	0.000	#	154.16	11210.65	1	987	13.572	0.000
COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS										
F-TEST TABLE										
GROUPS	YEARS		#	SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EEOR	
EARLY	47.47	56.79	#	48382.59	3145738.21	1	2253	34.652	0.000	
LATE	53.35	62.61	#	24858.23	1519313.30	1	1157	18.930	0.000	
MALE	47.76	55.93	#	30303.42	2566083.21	1	1823	21.528	0.000	
FEMALE	50.88	62.13	#	54898.46	2312679.64	1	1738	41.150	0.000	
NORTH	45.80	58.13	#	36588.04	1323892.37	1	963	26.614	0.000	
SOUTH	50.54	59.28	#	49414.67	3572769.33	1	2598	35.933	0.000	
PUBLIC	49.25	59.29	#	71505.83	3937352.46	1	2873	52.176	0.000	
SEPARATE	49.21	57.60	#	12075.68	967325.05	1	668	8.589	0.004	

FIGURE 158



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 2      *Rounds numerals to required accuracy including thousandths.*

TEST ITEMS

2. Round off the following numbers as required:

- a. Round 3.8 off to the nearest whole number. \_\_\_\_\_
- b. Round 5.43 off to the nearest tenth. \_\_\_\_\_
- c. Round 7.27 off to the nearest tenth. \_\_\_\_\_
- d. Round 6.485 off to the nearest hundredth. \_\_\_\_\_
- e. Rewrite the following decimal fraction rounded off to the nearest hundredth.  
0.36653 \_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR      GRADE:6      STRAND:1      OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS:    1978 N=1897    1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	45.60	33.87	13.28	13.13	14.18	19.36	26.94	33.63
MEAN (%)	14.42	15.75	59.88	59.91	79.93	79.88	99.90	99.82

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST			
HC: PRCPOR78=PRCPOR79				SS		DF	
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN
A:	7.127	3563	0.000 #	610.04	323735.48	1	1428
B:	0.136	3563	0.892 #	0.09	494.60	1	469
C:	-4.150	3563	0.000 #	0.36	593.56	1	590
D:	-4.350	3563	0.000 #	1.73	1477.28	1	1070
							E-RATIO
							PECB

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS  
F-TEST TABLE

GROUPS	YEARS		#	SS		DF		E-RATIO	PECB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	51.06	58.66	#	32147.83	3289894.92	1	2253	22.016	0.000
LATE	56.39	68.43	#	41991.12	1534678.42	1	1157	31.657	0.000
MALE	52.70	60.72	#	29166.07	2581254.42	1	1823	20.598	0.000
FEMALE	52.85	63.84	#	52331.83	2474708.17	1	1738	36.753	0.000
NORTH	48.50	62.46	#	46922.84	1366980.37	1	963	33.056	0.000
SOUTH	54.32	62.16	#	39710.81	3680426.07	1	2598	28.032	0.000
PUBLIC	53.80	62.14	#	49743.95	4104050.63	1	2873	34.823	0.000
SEPARATE	48.51	62.68	#	34466.73	947576.17	1	688	25.025	0.000

FIGURE 159



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 3 *Writes decimal numerals using expanded notation.*

TEST ITEMS

3. Rewrite the following decimal numerals using expanded notation.

- 1. 6.4 \_\_\_\_\_
- 2. 3.83 \_\_\_\_\_
- 3. 4.769 \_\_\_\_\_
- 4. 5.9 \_\_\_\_\_
- 5. 6.05 \_\_\_\_\_
- 6. 47.203 \_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	58.67	47.06	2.53	2.82	8.07	8.99	30.73	41.13
MEAN (%)	2.95	3.70	50.52	50.18	79.30	78.67	99.73	99.81

TABLES CCMPARING 1978 AND 1979 MEAN SCCRES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PRCPOR78=PRCPOR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	6.932	3563	0.000	#	262.33	166136.40	1	1896	2.994 0.084
B:	-0.532	3563	0.595	#	2.80	263.28	1	93	0.990 0.322
C:	-0.991	3563	0.322	#	30.65	15636.75	1	301	0.590 0.443
D:	-6.468	3563	0.000	#	1.88	2361.64	1	1267	1.008 0.316

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
YEARS			#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
=====	1978	1979	#						
EARLY	38.11	48.11	#	55588.71	4721833.56	1	2253	26.524	0.000
LATE	41.88	56.00	#	57727.48	2458920.61	1	1157	27.163	0.000
MALE	39.28	47.67	#	32013.29	3867258.01	1	1823	15.091	0.000
FEMALE	40.87	55.04	#	87030.24	3647260.79	1	1738	41.472	0.000
NORTH	37.03	46.54	#	21771.92	1965162.16	1	963	10.669	0.001
SOUTH	41.15	53.08	#	92075.48	5552658.47	1	2598	43.081	0.000
PUBLIC	40.55	52.16	#	96505.67	6062921.72	1	2873	45.731	0.000
SEPARATE	38.01	47.59	#	15746.72	1468120.43	1	688	7.379	0.007

FIGURE 160



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 4 Identifies place value to billions  
(0.0001 - 1 000 000 000)

TEST ITEMS

4. State what place value the digit 6 is in the following numerals.
- A. 347.516 \_\_\_\_\_
- B. 651.053 \_\_\_\_\_
5. A. On the blank, write the number that has a 5 in the tenths place.
- a. 638.518    b. 251.053    c. 332.051    d. None \_\_\_\_\_
- B. On the blank, write the number that has a 7 in the thousandths place.
- a. 156.527    b. 905.725    c. 362.374    d. None \_\_\_\_\_
6. Rewrite the following numbers using words.
- 3 579 147.268
- \_\_\_\_\_
- \_\_\_\_\_
- 365 148.29
- \_\_\_\_\_
- \_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 OBJECTIVE: 4  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	50.76	37.89	20.88	19.42	6.59	8.51	21.77	34.17
MEAN (%)	17.57	20.29	57.56	57.50	76.17	76.06	95.47	96.27

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PRCPOR78=PROPOR79				SS		DF			
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	EECB
A:	7.714	3563	0.000 #	2813.72	486738.26	1	1593	5.209	0.003
B:	1.076	3563	0.282 #	0.69	5860.92	1	718	0.084	0.772
C:	-2.177	3563	0.030 #	0.88	3075.63	1	265	0.076	0.783
D:	-8.268	3563	0.000 #	152.11	38775.27	1	981	3.848	0.050

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE								
GROUPS			SS		DF			
=====	1978	1979	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	EECB
EARLY	44.53	55.01 #	61169.88	2748485.85	1	2253	50.142	0.000
LATE	51.44	63.75 #	43902.49	1306019.24	1	1157	38.893	0.000
MALE	46.34	56.41 #	45979.83	2160001.27	1	1823	38.806	0.000
FEMALE	47.16	60.13 #	72923.13	2102751.84	1	1738	60.274	0.000
NORTH	43.14	59.84 #	67173.64	1167417.88	1	963	55.411	0.000
SOUTH	48.04	57.61 #	59170.54	3090844.45	1	2598	45.736	0.000
PUBLIC	48.10	59.62 #	95048.25	3349465.39	1	2873	81.528	0.000
SEPARATE	41.10	52.36 #	21776.91	891099.75	1	688	16.814	0.000

FIGURE 161



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 5 Identifies and orders integers.

TEST ITEMS

7. Place the opposite value of each integer on the blanks:

- a. -1 \_\_\_\_\_
- b. 2 \_\_\_\_\_
- c. -3 \_\_\_\_\_
- d. -6 \_\_\_\_\_
- e. 4 \_\_\_\_\_
- f. 5 \_\_\_\_\_

8. Put the correct sign ( $>$  =  $<$ ) to compare the integers below:

- a. 6 ☐ -6
- b. 0 ☐ -6
- c. -7 ☐ 3
- d. -6 ☐ -4
- e. -9 ☐ -7

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 OBJECTIVE: 5  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	19.98	11.39	10.44	10.31	18.40	19.78	51.19	58.51
MEAN (%)	22.28	22.78	58.95	58.40	77.75	77.77	98.72	98.77

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	6.986	3563	0.000	#	30.58	160110.88	1	567	0.108 0.742
B:	0.123	3563	0.902	#	27.78	7559.67	1	368	1.352 0.246
C:	-1.052	3563	0.293	#	0.03	13866.74	1	677	0.002 0.968
D:	-4.385	3563	0.000	#	1.37	19158.51	1	1945	0.140 0.709

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
GROUPS				SS		DF			
				YEARS					
				1978	1979	#	BETWEEN	WITHIN	F-RATIO PROB
EARLY	73.10	80.63	#	31500.45	1979147.47	1	2253	35.859	0.000
LATE	80.81	84.38	#	3704.57	760665.83	1	1157	5.635	0.018
MALE	75.62	81.24	#	14338.56	1536348.00	1	1823	17.014	0.000
FEMALE	75.25	82.38	#	22024.26	1359009.08	1	1738	28.166	0.000
NORTH	72.19	81.01	#	18729.52	804261.44	1	963	22.426	0.000
SOUTH	76.62	82.10	#	19400.63	2084023.37	1	2598	24.185	0.000
PUBLIC	77.33	81.77	#	14104.83	2220900.68	1	2873	18.246	0.000
SEPARATE	67.60	81.90	#	35105.22	646919.45	1	688	37.334	0.000

FIGURE 162



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 6 Identifies applications of proportional ratios.

TEST ITEMS

9. Answer the following ratio questions.
- a. Jane typed 40 words in one minute. Give the ratio of words to minutes.
- b. Jim had 8 mice and 3 cats. Give the ratio of mice to cats.
- c. At Sue's party, there were 3 boys to every 2 girls. There were 9 boys at the party. How many girls at the party?
- d. There are 36 children in a class. The ratio of boys to girls is 5:4. How many boys are there in the class?

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 OBJECTIVE: 6  
TOTAL NUMBER OF PUPILS: 1978 N=1297 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	41.01	29.50	23.09	23.68	22.30	26.26	13.60	20.56
MEAN (%)	13.77	14.87	50.08	50.17	74.94	75.00	100.00	99.98

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PRCPOR78=PRCPOR79			SS		DF				
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PEOF
A:	7.164	3563	0.000	#	362.47	203851.44	1	1268	2.255 0.134
B:	-0.417	3563	0.677	#	1.78	819.54	1	831	1.809 0.179
C:	-2.757	3563	0.006	#	0.75	2012.41	1	859	0.321 0.571
D:	-5.541	3563	0.000	#	0.09	69.24	1	599	0.752 0.386

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====			1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN
EARLY	45.45	54.07	#	41306.82	2385067.47	1	2253	39.020	0.000
LATE	51.74	56.87	#	19170.35	1206873.77	1	1157	18.378	0.000
MALE	47.38	55.91	#	33039.06	1998442.91	1	1823	30.139	0.000
FEMALE	47.67	57.16	#	38990.23	1761719.02	1	1738	37.821	0.000
NORTH	43.02	55.58	#	37974.74	1034337.43	1	963	35.356	0.000
SOUTH	49.16	56.88	#	38563.61	2742004.34	1	2598	36.538	0.000
PUBLIC	48.57	56.48	#	44750.01	2997657.00	1	2873	42.889	0.000
SEPARATE	43.18	56.70	#	31369.72	784546.54	1	688	27.509	0.000

FIGURE 163



LEVEL F (Grade 6)

NUMBER

OBJECTIVE 7 Uses decimal fractions to express and solve for percent.

TEST ITEMS

10. Express the following numbers as percentages:

- a.  $\frac{73}{100}$

\_\_\_\_\_
- b.  $\frac{3}{100}$

\_\_\_\_\_
- c. 0.63

\_\_\_\_\_
- d. 0.225

\_\_\_\_\_
- e. 0.666

\_\_\_\_\_
- f. 1.25

\_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:1 CEJECTIVE: 7  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	36.06	25.78	26.09	23.20	25.83	29.74	12.02	21.28
MEAN (%)	11.20	13.82	50.07	50.00	72.45	73.74	99.89	99.91

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST					
HC: PRCPOR78=PRCPOR79			SS		DF			
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO
A:	6.606	3563	0.000	# 1814.34	266181.13	1	1112	7.580
B:	1.997	3563	0.046	# 0.98	275.53	1	880	3.146
C:	-2.602	3563	0.009	# 410.78	63732.01	1	984	6.342
D:	-7.462	3563	0.000	# 0.03	480.24	1	581	0.042
								0.006
								0.077
								0.012
								0.838

COMPARING THE MEAN SCORES OF PLPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE					
GROUPS			SS		DF			
YEARS								
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO
EARLY	45.29	56.07	#	64788.49	2474297.62	1	2253	58.994
LATE	52.65	62.50	#	28112.18	1097664.00	1	1157	29.632
MALE	47.45	56.96	#	41135.93	2004008.82	1	1823	37.420
FEMALE	48.21	59.80	#	58203.95	1768622.20	1	1738	57.196
NORTH	39.72	56.88	#	70923.24	1013924.63	1	963	67.361
SOUTH	50.76	58.91	#	42984.82	2715803.61	1	2598	41.120
PUBLIC	48.00	58.83	#	84059.93	3007984.86	1	2873	80.288
SEPARATE	47.09	56.33	#	14680.65	766418.89	1	688	13.179
								0.000
								0.000
								0.000
								0.000
								0.000
								0.000
								0.000

FIGURE 164



was around 82 percent.

Over one-half of the pupils had difficulty with identifying applications of proportional ratios. About forty-seven percent of the Zone One grade six pupils could correctly identify at least three of the four proportional ratio items.

One in four of the grade six pupils in 1979 could not use decimal fractions to express and solve for percent. The proportions were spread rather evenly between all four achievement categories.

OPERATIONS AND PROPERTIES (Eight objectives; Figures 165 to 172)

#### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent category.

#### Hypothesis 2

Three objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

#### Findings

Performances on the adding and subtracting of whole numbers were fairly constant over the two testing periods. Eighty percent of the students could solve at least two of the four problems on the test. One-quarter of the pupils answered all four of the rather large problems correctly.



















## LEVEL F (Grade 6)

## OPERATIONS AND PROPERTIES

## OBJECTIVE 5

Mentally computes simple addition, subtraction, multiplication and division problems.

## TEST ITEMS

15. Solve these problems in your head and write the answers. Do not use scratch paper.

a.  $10\text{ g} + 252\text{ g} + 32\text{ g} =$  \_\_\_\_\_ g

b.  $150\text{ mL} - 28\text{ mL} =$  \_\_\_\_\_ mL

c.  $153\text{ cm} - 29\text{ cm} =$  \_\_\_\_\_ cm

d.  $43\text{ m} + 62\text{ m} =$  \_\_\_\_\_ m

e.  $9 \times 12\text{ cm} =$  \_\_\_\_\_ cm

f.  $160\text{ cm} \div 5 =$  \_\_\_\_\_ cm

g.  $13\text{ m} \times 11 =$  \_\_\_\_\_ m

h.  $192\text{ dm} \div 6 =$  \_\_\_\_\_ dm

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D

CRITERION CATEGORIES FOR GRADE:6 STRAND:2 CEJECTIVE: 5

TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.66	13.67	21.14	20.74	17.61	18.47	44.60	47.12
MEAN (%)	21.36	21.22	57.42	57.51	75.00	75.00	94.53	94.70

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PRCPOR78=PRCPOR79			#	SS		DF			
	T-CALC	DE	FRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PAGE
A:	2.476	3563	0.013	#	2.73	120208.38	1	542	0.012	0.912
B:	0.289	3563	0.772	#	1.69	28078.54	1	745	0.045	0.832
C:	-0.666	3563	0.506	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-1.510	3563	0.131	#	11.93	62515.55	1	1630	0.311	0.577

### COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

GROUPS	YEARS		#	F-TEST TABLE					
				SS		DF			
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
EARLY	69.85	73.26	#	6478.74	1729015.58	1	2253	8.442	0.004
LATE	73.25	74.15	#	236.16	754508.77	1	1157	0.362	0.548
MALE	67.83	69.81	#	1771.64	1425454.90	1	1823	2.266	0.133
FEMALE	74.46	76.96	#	2712.42	1135342.18	1	1738	4.152	0.042
NORTH	71.56	72.34	#	145.54	771228.49	1	963	0.182	0.670
SOUTH	70.88	73.68	#	5060.57	1830950.91	1	2598	7.181	0.008
PUBLIC	71.24	72.45	#	1050.10	2156308.60	1	2873	1.399	0.237
SEPARATE	70.33	76.91	#	7439.03	441236.01	1	688	11.599	0.001

FIGURE 169







OPERATIONS  
AND PROPERTIES

LEVEL F (Grade 6)

OBJECTIVE 7    Demonstrates mastery of basic facts.

TEST ITEMS    25. Solve the following. You have 1.5 minutes.

- A.  $18 - 7 =$  \_\_\_\_\_

B.  $4 \times$  \_\_\_\_\_  $= 36$

C.  $64 \div 8 =$  \_\_\_\_\_

D.  $7 +$  \_\_\_\_\_  $= 16$

E.  $8 \times$  \_\_\_\_\_  $= 56$

F.  $8 \times$  \_\_\_\_\_  $= 32$

G.  $56 \div 7 =$  \_\_\_\_\_

H.  $9 +$  \_\_\_\_\_  $= 15$

I.  $14 - 6 =$  \_\_\_\_\_

J.  $48 = 6 \times$  \_\_\_\_\_

K. \_\_\_\_\_  $\div 6 = 9$

L.  $11 + 9 =$  \_\_\_\_\_

M.  $33 \div$  \_\_\_\_\_  $= 3$

N.  $9 \div$  \_\_\_\_\_  $= 1$

O.  $9 \times 0 =$  \_\_\_\_\_

P.  $3 +$  \_\_\_\_\_  $= 12$

Q.  $12 \times$  \_\_\_\_\_  $= 0$

R.  $21 \div 3 =$  \_\_\_\_\_

S.  $4 +$  \_\_\_\_\_  $= 19$

T.  $18 -$  \_\_\_\_\_  $= 9$

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR    GRADE:6    STRAND:2    OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS:    1978 N=1897    1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	16.61	14.81	17.19	15.89	19.61	16.55	46.60	52.76
MEAN (%)	27.75	26.44	55.21	55.28	75.40	75.43	96.63	96.72

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: FRCPOR78=PROPOR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	RECB
A:	1.469	3563	0.142	#	237.14	56964.46	1	560	1.370 0.242
B:	1.040	3563	0.299	#	0.68	14738.74	1	589	0.027 0.869
C:	2.366	3563	0.018	#	0.16	16087.34	1	646	0.006 0.937
D:	-3.669	3563	0.000	#	3.33	39163.28	1	1762	0.150 0.699

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS			SS		DF				
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	RECB
EARLY	72.80	75.18	#	3139.82	1595894.77	1	2253	4.433	0.036
LATE	76.26	78.14	#	1023.43	793006.94	1	1157	1.493	0.222
MALE	72.51	74.00	#	1014.76	1373933.19	1	1823	1.346	0.246
FEMALE	75.39	78.50	#	4205.43	1121135.72	1	1738	6.519	0.011
NORTH	76.18	76.41	#	13.27	631905.48	1	963	0.020	0.887
SOUTH	73.09	76.13	#	5964.17	1871985.83	1	2598	8.277	0.004
PUBLIC	73.50	75.80	#	3776.46	2060585.07	1	2873	5.265	0.022
SEPARATE	75.61	77.91	#	910.49	444389.36	1	688	1.410	0.236

FIGURE 171







The proportion of pupils achieving in the 85-100 percent category for multiplying with one, two and three digit multipliers increased significantly in 1979. About one-third of the pupils in 1979 successfully answered all four multiplication items. An additional forty-five percent group achieved within categories B and C (50-84 percent), also for 1979.

Two thirds of the grade six pupils could divide at least two of the three division items (Figure 163).

One-half of the pupils were able to check multiplication solutions by division and vice versa to the 75 to 99 percent level. Another one pupil in five could check one of the two algorithms.

Two-thirds of the students achieved within categories C and D (65-100 percent) on the mental computation of simple addition, subtraction, multiplication and division problems.

Less than one-half of the pupils could solve two, three or all four of the test problems on multiplying and dividing decimals. Although there were some significant sub-group gains their mean scores ranged from 35 to 42 percent.

Significant improvement in the mastery of the basic facts was noted for 1979; still only one-half of the pupils scored to the 85 percent level. A further one-third of the grade six pupils had basic fact achievement within the 50-84 percent range.

The 1979 performance on problem-solving and estimating answers showed some gains over the 1978 figures. However,



over two-thirds of the students were at or below the 64 percent level (Figure 172).

#### MEASUREMENT (Seven objectives; Figures 173 to 179)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

##### Hypothesis 2

Four objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

##### Findings

One-quarter of the pupils could not calculate the perimeter of the two quadrilaterals given in the test. Significantly more pupils in 1979 (36 percent compared to 30 percent) could solve both items, however.

Over one-half of the grade six pupils could not calculate the area of the triangle and quadrilateral using the formulae. Only one student in five achieved to the 100 percent level.

Performance on finding the volume of rectangular solids was slightly below that for area. Nearly sixty percent of the pupils could not calculate the volume for either of two solid figures when the dimensions were given.

Three items were included that requires the reading, translating, measuring or drawing of lengths to scale. While











## LEVEL F (Grade 6)

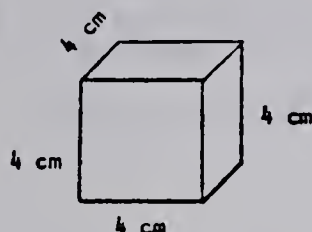
## MEASUREMENT

### OBJECTIVE 3

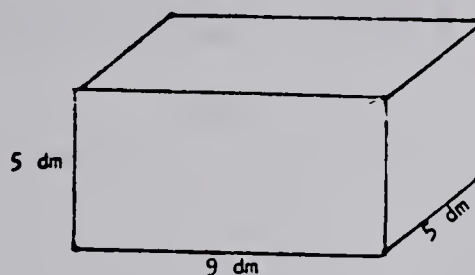
Finds volume of rectangular solids using formulae.

## TEST ITEMS

4. Find the volume of a cube with sides of 4 cm.



5. Find the volume of the rectangular solid shown in the diagram.



## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.

CRITERION CATEGORIES FOR GRADE:6 STRAND:3 CEJECTIVE: 3

TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	65.16	58.81	10.75	12.41	8.70	10.97	15.39	17.81
MEAN (%)	6.14	8.02	50.00	50.00	72.02	71.31	100.00	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HO: PROCFOR78=PROCFOR79			#	SS		DF			
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-PROP
A:	3.897	3563	0.000	#	1940.53	402890.32	1	2215	10.669	0.001
B:	-1.545	3563	0.123	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
C:	-2.282	3563	0.023	#	43.58	20211.85	1	346	0.746	0.388
D:	-1.936	3563	0.053	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE-SUBGROUPS-----

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	29.83	35.10	#	15472.26	317208.15	1	2253	10.990	0.001
LATE	34.81	39.92	#	7564.39	1795723.89	1	1157	4.874	0.028
MALE	30.83	37.56	#	20550.87	2664814.43	1	1823	14.059	0.000
FEMALE	31.24	35.50	#	7854.14	2514907.67	1	1738	5.428	0.020
NORTH	30.96	33.44	#	1486.45	1411865.30	1	963	1.014	0.314
SOUTH	31.06	37.73	#	28825.77	3763563.01	1	2552	15.899	0.000
PUBLIC	32.54	37.29	#	16191.06	4242081.01	1	2873	10.966	0.001
SEPARATE	24.80	33.44	#	12816.01	917828.52	1	688	9.607	0.002

FIGURE 175















## LEVEL F (Grade 6)

## MEASUREMENT

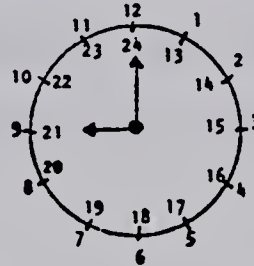
**OBJECTIVE 7** Reads the 24 hour clock and writes corresponding time notation.

## TEST ITEMS

10. Using 24 hour notations, write the times for the clocks below.  
It is before midnight.



11. Circle the times the clocks show:



- (a) 09 21 and 21 09  
(b) 09 00 and 21 00  
(c) 12 24 and 24 12  
(d) 00 12 and 24 00

- (a) 14 20 and 17 05  
(b) 05 14 and 05 02  
(c) 05 10 and 17 10  
(d) 17 05 and 14 10

## ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:3 OBJECTIVE: 7  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	42.01	32.85	22.72	26.20	10.96	9.89	24.30	31.06
MEAN (%)	10.98	10.72	50.03	50.11	75.00	75.00	99.81	99.90

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

	PROPORTION TEST			#	F-TEST					
	HC:	PRC POR78=	PROP OR79	#	SS		DF			
	T-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	FGE
A:	5.630	3563	0.000	#	21.59	208764.42	1	1343	0.139	0.709
B:	-2.415	3563	0.016	#	1.58	775.17	1	866	1.769	0.184
C:	1.044	3563	0.297	#	<<<<<<<<<< SSW IS EQUAL TO ZERO >>>>>>>>>>					
D:	-4.508	3563	0.000	#	2.12	1697.32	1	977	1.222	0.269

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS-----  
F-TEST TABLE-----

GROUPS	YEARS		#	SS		DF		E-RATIO	FEEB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	47.99	54.45	#	23239.39	3084492.32	1	2253	16.975	0.000
LATE	49.66	57.47	#	17678.33	1598999.84	1	1157	12.792	0.000
MALE	50.01	55.87	#	15575.67	2455813.37	1	1823	11.562	0.001
FEMALE	46.82	54.29	#	24169.06	2427680.35	1	1738	17.303	0.000
NORTH	50.72	56.82	#	8965.71	1315214.99	1	963	6.565	0.011
SOUTH	47.64	54.44	#	29913.08	3568743.41	1	2598	21.776	0.000
PUBLIC	49.27	54.70	#	21131.42	3985622.71	1	2873	15.232	0.000
SEPARATE	45.09	56.74	#	23293.57	897466.39	1	628	17.857	0.000

FIGURE 179



over fifty percent of the pupils in 1979 could not use a scale (1 cm=1 km) to find a specified distance, three-quarters of the students succeeded in drawing at least one of two diagrams to scale.

The achievement means on the test item which measured the knowledge students had of the interrelationships among the metric units of length, capacity and mass were low. Only ten percent of the Zone One population scored at the 85-100 percent level.

Slightly less than one-third of the students in 1979, significantly more than in 1978, could read all four of the 24-hour clocks.

#### GEOMETRY (Three objectives; Figures 180-182)

##### Hypothesis 1

None of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement level.

##### Hypothesis 2

All three objectives had significant increases in the proportion of pupils achieving at the 85-100 percent level in 1979 over 1978.

##### Findings

Two-thirds of the grade six pupils could identify at least four of the following terms: line, line segment, ray, intersecting lines, parallel lines, and perpendicular lines. One-half of the pupils in 1979 could perform a majority of




LEVEL F (Grade 6)

GEOMETRY

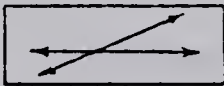
OBJECTIVE 1 Identifies and names lines, line segments, rays, intersecting lines, parallel lines, perpendicular lines.

TEST ITEMS

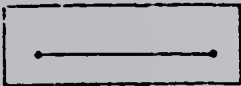
12. In each box below there is a different type of line. Write the name on the blank. You may choose from these answers: line, intersecting lines, ray, line segment, parallel lines, perpendicular line.



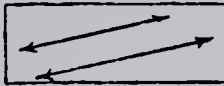
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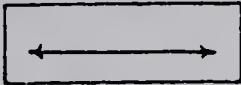
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ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:4 OBJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	27.52	21.88	16.76	12.95	23.46	26.92	32.26	38.25
MEAN (X)	18.14	16.42	50.05	50.00	69.08	68.97	99.57	100.00

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
A:	3.883	3563	0.000	#	635.36	184614.86	1	885	3.046 0.081
B:	3.184	3563	0.002	#	0.35	138.02	1	532	1.362 0.244
C:	-2.378	3563	0.017	#	2.92	30094.41	1	892	0.087 0.769
D:	-3.739	3563	0.000	#	0.23	138.44	1	1248	2.088 0.149

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS  
F-TEST TABLE

GROUPS	YEARS		#	SS		DF		F-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
EARLY	60.39	65.86	#	16671.74	2506979.90	1	2253	14.983	0.000
LATE	64.77	69.89	#	7587.77	1179507.07	1	1157	7.443	0.007
MALE	62.01	67.19	#	12222.84	1954057.60	1	1823	11.174	0.001
FEMALE	61.66	66.55	#	10374.72	1868089.68	1	1738	9.652	0.002
NORTH	53.40	63.68	#	25430.55	1138040.52	1	963	21.519	0.000
SOUTH	64.90	68.10	#	6626.48	2668796.35	1	2598	6.451	0.011
PUBLIC	62.56	66.26	#	9824.79	3132068.35	1	2873	9.012	0.003
SEPARATE	58.85	69.47	#	19352.59	723557.64	1	688	18.402	0.000

FIGURE 180



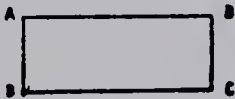
LEVEL F (Grade 6)

GEOMETRY

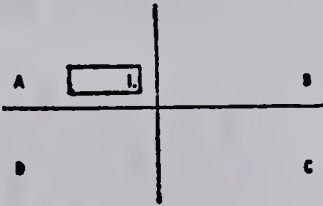
OBJECTIVE 2 Translates, rotates, reflects, and enlarges 2-dimensional figures.

TEST ITEMS

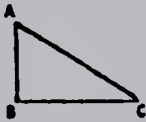
13. Rotate clockwise rectangle ABCD one quarter turn around point A. Draw the result.



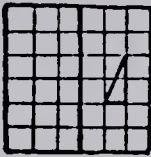
16. Translate the rectangle from quadrant A to B. Draw the result.



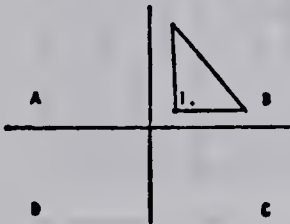
14. Rotate  $\triangle ABC$  one half turn around point B. Draw the result.



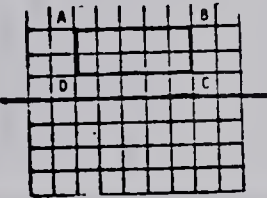
17. Draw a reflection for this triangle.



15. Translate the triangle from quadrant B to quadrant D. Draw the result.



18. Draw a reflection for this rectangle ABCD.



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:4 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	38.64	27.46	26.04	21.04	27.62	39.57	7.70	11.93
MEAN (%)	27.44	25.86	53.34	52.97	73.14	74.18	98.86	98.62

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PROPOR78=PROPOR79				SS		DF			
I-CALC	DE	EPOR8	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EEOR
A:	7.063	3563	0.000 #	711.83	228619.03	1	1169	3.702	0.055
B:	3.501	3563	0.000 #	28.45	13828.06	1	843	1.735	0.188
C:	-7.557	3563	0.000 #	315.92	70657.95	1	1162	5.285	0.022
D:	-4.267	3563	0.000 #	4.87	3110.27	1	343	0.537	0.464

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

				F-TEST TABLE					
				SS		DF			
GROUPS	YEARS		#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	EEOR
=====	1978	1979	#						
EARLY	50.95	58.55	#	32149.74	1452640.97	1	2253	46.527	0.000
LATE	55.41	61.29	#	10023.51	715601.43	1	1157	16.206	0.000
MALE	53.24	60.23	#	22216.15	1254095.65	1	1823	32.294	0.000
FEMALE	51.33	58.46	#	22029.63	1036627.58	1	1738	36.935	0.000
NORTH	46.49	57.03	#	26762.04	638186.86	1	963	40.383	0.000
SOUTH	54.42	60.25	#	22004.77	1628802.50	1	2598	35.098	0.000
PUBLIC	52.51	57.93	#	20959.57	1893797.34	1	2872	31.797	0.000
SEPARATE	51.45	65.39	#	33402.90	385168.05	1	668	56.665	0.000

FIGURE 181



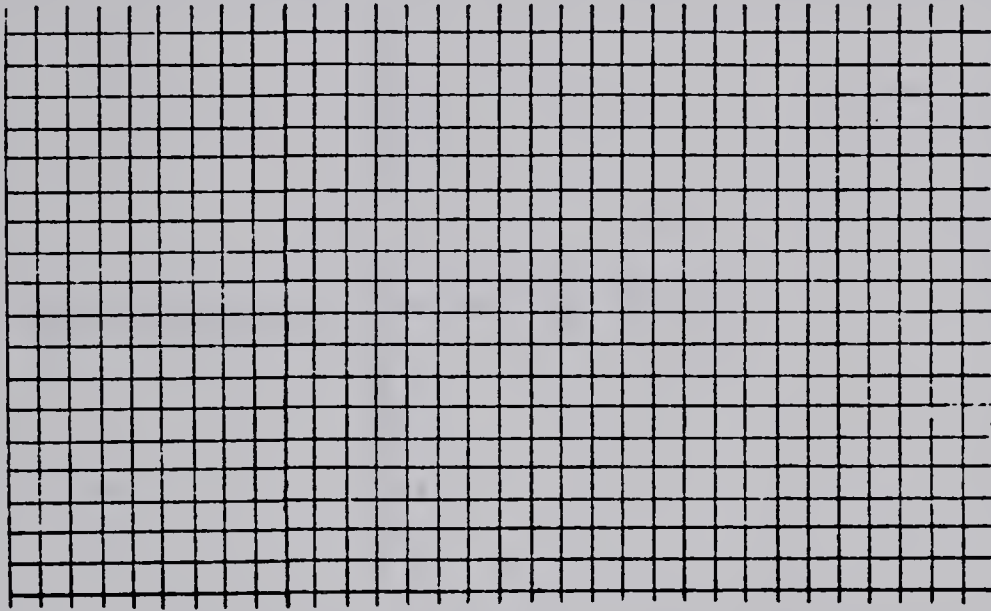
LEVEL F (Grade 6)

GEOMETRY

OBJECTIVE 3 Constructs 3-dimensional objects.

TEST ITEMS

19. Draw a diagram that could be cut out and assembled into the shape of a cube.



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:4 OBJECTIVE: 3  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	55.46	49.34	1.27	1.44	2.69	1.80	40.59	47.42
MEAN (%)	0.65	1.41	50.35	50.00	77.94	78.61	89.99	99.58

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST						
HC: PROPR78=PROPR79			SS		DF				
I-CALC	DE	PROB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
A:	3.649	3563	0.000	#	265.24	42717.50	1	1873	11.630 0.001
B:	-0.449	3563	0.654	#	1.45	66.55	1	46	1.000 0.323
C:	1.779	3563	0.075	#	8.48	4514.84	1	79	0.148 0.701
D:	-4.102	3563	0.000	#	0.04	207.89	1	1559	0.307 0.579

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE									
GROUPS	YEARS		#	SS		DF		E-RATIO	PROB
	1978	1979		BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
EARLY	42.54	48.67	#	20868.80	5344758.08	1	2253	8.797	0.003
LATE	44.94	53.37	#	20565.55	2768736.29	1	1157	8.594	0.003
MALE	44.96	52.01	#	22574.66	4318203.27	1	1823	9.530	0.002
FEMALE	42.33	48.40	#	15926.86	4114504.62	1	1738	6.728	0.010
NORTH	45.21	53.62	#	17020.65	2246007.56	1	963	7.298	0.007
SOUTH	43.12	48.95	#	21982.34	6186489.86	1	2598	9.231	0.002
PUBLIC	45.10	48.73	#	9397.18	6774773.93	1	2873	3.985	0.046
SEPARATE	37.78	56.59	#	60748.78	1634641.81	1	688	25.568	0.000

FIGURE 132



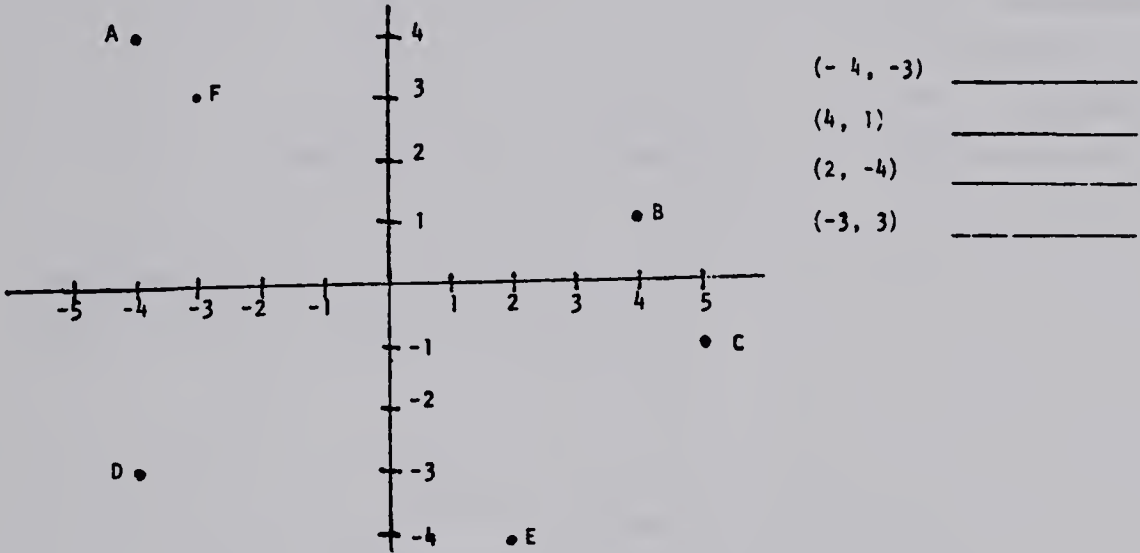
LEVEL F (Grade 6)

GRAPHING

OBJECTIVE 1 Locates points in all four quadrants.

TEST ITEMS

20. Name the letters that show where (-4, -3), (4, 1), (2, -4), and (-3, 3) are located.



ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D.  
CRITERION CATEGORIES FOR GRADE:6 STRAND:5 DEJECTIVE: 1  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	23.19	12.59	5.32	3.06	5.96	5.70	65.52	78.66
MEAN (%)	5.83	5.87	50.00	50.16	75.44	75.35	99.99	99.99

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST			F-TEST		
HC: PRCPOR78=PRCPOR79	#		SS	DF	
I-CALC	DE	PROB	BETWEEN	WITHIN	F-RATIO
A:	8.182	3563	0.000	#	0.22
B:	3.342	3563	0.001	#	0.90
C:	0.332	3563	0.740	#	0.43
D:	-8.683	3563	0.000	#	0.03

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

F-TEST TABLE					
GROUPS	YEARS	#	SS	DF	
=====	1978	1979	#	BETWEEN	WITHIN
EARLY	73.54	84.92	#	72148.29	3068191.20
LATE	76.18	86.38	#	30141.56	1410582.96
MALE	73.37	85.53	#	67181.56	2402949.95
FEMALE	74.71	84.89	#	44855.45	2293095.70
NORTH	74.21	85.00	#	28037.04	1279516.50
SOUTH	73.96	85.30	#	83184.06	3417500.75
PUBLIC	74.79	84.14	#	62516.71	3831840.87
SEPARATE	70.84	89.75	#	61326.77	852443.76

FIGURE 183



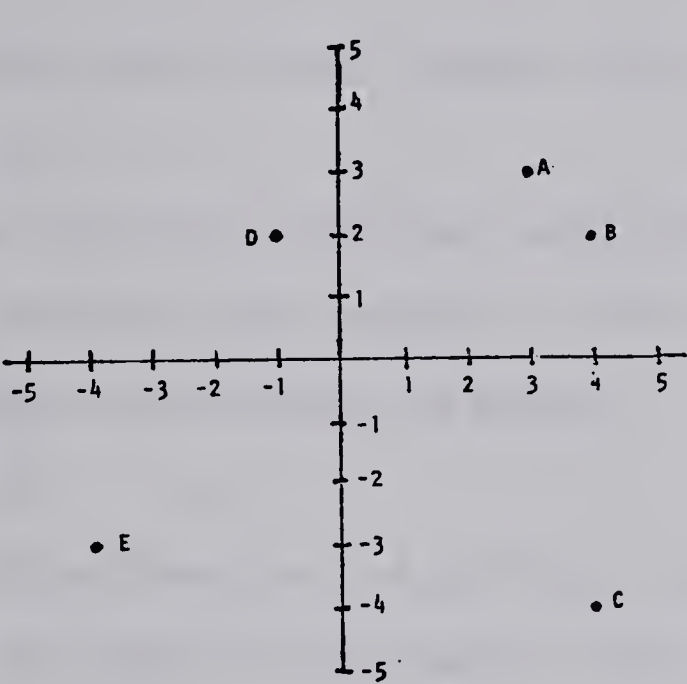
LEVEL F (Grade 6)

GRAPHING

OBJECTIVE 2 Generates ordered pairs from a given relationship involving integers.

TEST ITEMS

21. Give the coordinates for points



- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_

ANALYSIS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND:5 OBJECTIVE: 2  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER (%)	32.79	22.54	8.43	9.23	29.41	31.53	29.36	36.69
MEAN (%)	11.29	13.21	50.21	50.22	76.91	77.01	99.67	99.84

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
H0: PRCPOR78=PROPOR79				SS		DF				
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PRCB	
A:	6.799	3563	0.000	#	859.39	217066.26	1	996	3.943	0.047
B:	-0.839	3563	0.402	#	0.01	541.40	1	312	0.003	0.957
C:	-1.373	3563	0.170	#	2.73	69789.90	1	1082	0.042	0.837
D:	-4.651	3563	0.000	#	0.24	1431.89	1	1167	0.196	0.658

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE SUBGROUPS

			F-TEST TABLE						
GROUPS		YEARS	#	SS		DF			
=====	1978	1979	#	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PROB
EARLY	58.49	67.78	#	48107.06	3030598.78	1	2253	35.764	0.000
LATE	62.48	71.41	#	23132.06	1449094.35	1	1157	16.469	0.000
MALE	59.60	68.09	#	32771.21	2373921.49	1	1823	25.166	0.000
FEMALE	60.18	68.98	#	33577.27	2290095.15	1	1738	25.482	0.000
NORTH	58.07	65.83	#	14510.95	1369645.35	1	963	10.203	0.001
SOUTH	60.54	69.56	#	52557.98	3287975.78	1	2598	41.529	0.000
PUBLIC	61.47	67.56	#	26489.03	3749824.65	1	2873	20.295	0.000
SEPARATE	53.30	72.61	#	64039.23	886185.10	1	688	49.606	0.000

FIGURE 184



the translations, rotations and reflections required in transformational geometry.

About fifty percent of the pupils could draw a figure that when cut out would form a 3-dimensional cube.

GRAPHING (Two objectives; Figures 183 and 184)

#### Hypothesis 1

Neither of the objectives had performances where eighty percent of the Zone One pupils in 1978 and 1979 were in the 85-100 percent achievement category.

#### Hypothesis 2

Both objectives had significant increases in the proportion of pupils achieving to the 85-100 percent category in 1979 over 1978.

#### Findings

Almost eighty percent of the students could use ordered pairs to locate points in all four quadrants. However, only thirty-six percent of the pupils could give the coordinates for points located within the four quadrants with 100 percent accuracy. An additional forty percent of the students give the coordinates in one-half to four-fifths of the test examples.

### A. DISCUSSION OF THE GRADE SIX RESULTS

The accumulative data from the Zone One elementary mathematics tests does not reflect a success oriented program. Indeed the results from the grade six tests



summarized in Tables 20, 21 and 22, are somewhat representative of Division II (Grades 4, 5, 6) and lower than one might hope for.

### Number

The grade six number performance was significantly better 1979.

One of the two new topics offered at this level is that of integers and students did reasonably well with them. The other new topic, percent, calls for the use of decimal fractions to express and solve for percent. However two of the six items referenced to the objective involve common fractions. In addition most of the decimal forms are of the tricky variety and so the scores for percent are likely distorted.

The place value items continue to cause many children problems.

The low achievement figures for the objective involving the expressing of halves, quarters and fifths as fractions or decimals is somewhat surprising. Grade five students did better on what appears to be a more difficult item. The problems however may still lie with decimals. The data in Figures 160 and 161 add support to this notion.

The evidence on proportional ratios for up to and including grade six indicates that students may have difficulty with the format of the problems.

### Operations and Properties

The items used to test the pupils use of the whole



TABLE 21

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE NUMBER, OPERATIONS AND PROPERTIES, AND  
MEASUREMENT STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND: NUMBER  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	48.60	33.57	16.08	16.79	21.82	27.16	13.49	22.48
MEAN (%)	28.30	30.70	56.91	57.48	72.65	74.76	91.88	92.50

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PECE
A:	9.086	3563	0.000 #	2013.11	270988.55	1	1480	10.995	0.001
B:	-0.570	3563	0.569 #	47.50	11066.32	1	583	2.502	0.114
C:	-3.704	3563	0.000 #	265.64	27442.25	1	865	8.373	0.004
D:	-7.015	3563	0.000 #	58.32	14817.40	1	629	2.476	0.116

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND: OPERATIONS & PROPERTIES  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	32.63	26.68	21.24	21.10	34.21	36.69	11.91	15.53
MEAN (%)	31.95	31.94	57.77	57.81	74.39	74.58	90.32	89.78

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PECE
A:	3.875	3563	0.000 #	0.08	186295.51	1	1062	0.000	0.983
B:	0.103	3563	0.918 #	0.33	13337.57	1	753	0.019	0.892
C:	-1.545	3563	0.123 #	11.51	42286.12	1	1259	0.343	0.558
D:	-3.141	3563	0.002 #	34.27	7686.90	1	483	2.153	0.143

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND: MEASUREMENT  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(%)	62.94	55.52	15.76	17.87	15.76	17.87	5.54	8.75
MEAN (%)	24.44	26.69	56.76	57.51	74.04	74.55	90.90	91.33

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS									
PROPORTION TEST			F-TEST						
HO: PROPOR78=PROPOR79			SS		DF				
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PECE
A:	4.506	3563	0.000 #	2642.38	428059.74	1	2118	13.074	0.000
B:	-1.679	3563	0.094 #	83.99	11777.52	1	595	4.243	0.040
C:	-1.679	3563	0.094 #	37.57	19317.40	1	595	1.157	0.282
D:	-3.747	3563	0.000 #	11.00	5298.34	1	249	0.517	0.473



TABLE 22

ACHIEVEMENT MEANS IN 1978 AND 1979 WITHIN CATEGORIES  
A-D FOR THE GEOMETRY AND GRAPHING STRANDS

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND: GEOMETRY  
TOTAL NUMBER OF PUPILS: 1978 N=1297 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	48.87	39.45	15.02	13.49	20.03	24.88	16.08	22.18
MEAN (X)	28.74	29.40	56.90	56.44	75.18	75.86	93.03	93.51

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST					
HO: PRCPOR78=PROPOR79				SS		DF			
	I-CALC	DE	PROB	BETWEEN	WITHIN	BETWEEN	WITHIN	E-RATIO	PRCB
A:	5.647	3563	0.000	168.75	300443.20	1	1583	0.889	0.346
B:	1.306	3563	0.192	26.16	10309.71	1	508	1.289	0.257
C:	-3.470	3563	0.001	92.08	28371.95	1	793	2.574	0.109
D:	-4.642	3563	0.000	38.64	15128.65	1	673	1.719	0.190

ZONE ONE PUPILS IN 1978 AND 1979 ACHIEVING WITHIN EACH CATEGORY A-D  
CRITERION CATEGORIES FOR GRADE:6 STRAND: GRAPHING  
TOTAL NUMBER OF PUPILS: 1978 N=1897 1979 N=1668

	A: BELOW 50%		B: 50-64%		C: 65-84%		D: 85-100%	
	1978	1979	1978	1979	1978	1979	1978	1979
NUMBER(X)	26.62	14.69	6.64	7.25	23.25	23.74	43.49	54.32
MEAN (X)	13.32	14.13	55.69	55.30	76.27	76.47	96.53	96.90

TABLES COMPARING 1978 AND 1979 MEAN SCORES AND PROPORTIONS

PROPORTION TEST				F-TEST						
HO: PRCPOR78=PRCPOR79				SS		DF				
I-CALC	DE	PRCB	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PRCB	
A:	8.722	3563	0.000	#	109.80	184374.58	1	748	0.445	0.505
B:	-0.718	3563	0.473	#	9.14	5125.11	1	245	0.437	0.509
C:	-0.347	3563	0.729	#	8.94	35343.55	1	835	0.211	0.646
D:	-6.454	3563	0.000	#	57.65	30920.47	1	1729	3.224	0.073



TABLE 20  
THE 1978 AND 1979 ZONE ONE MEAN SCORES FOR GRADE  
SIX BY OBJECTIVES AND STRAND

ZONE ONE		GRADE SIX				JUNE/78			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	49.8%	1	64.0%	1	55.1%	1	61.8%	1	74.0%
2	52.8%	2	69.7%	2	35.2%	2	52.3%	2	59.9%
3	40.1%	3	61.7%	3	31.0%	3	43.7%		
4	46.7%	4	55.9%	4	38.5				
5	75.4%	5	71.1%	5	53.1%				
6	47.5%	6	35.5%	6	25.9%				
		7	73.9%	7	48.5%				
		8	49.3%						
-----									
AVG	51.4%		58.9%		41.6%		52.6%		67.0%

ZONE ONE		GRADE FIVE				JUNE/79			
NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1	59.0%	1	65.9%	1	59.9%	1	66.9%	1	85.2%
2	62.2%	2	64.7%	2	41.4%	2	59.4%	2	68.5%
3	51.3%	3	64.7%	3	36.6%	3	50.2%		
4	58.2%	4	59.2%	4	45.0%				
5	81.8%	5	73.3%	5	56.3%				
6	56.5%	6	38.9%	6	30.6%				
7	58.4%	7	76.2%	7	55.1%				
		8	53.4%						
-----									
AVG	61.1%		62.0%		46.4%		58.8%		75.9%

number algorithms with the four operations appear overly difficult for the purpose intended. This criticism could apply to many of the test items in the assessment instruments, particularly in Division II. Division I items seem to be more carefully designed so as not to confuse the



children, whereas the opposite may be an implicit procedure at the grade four, five and six levels.

Pupils in grade six still do not show mastery performances on the basic facts. Many factors such as the emphasis given to immediate recall by teachers or the lack of retention by pupils may be contributing to the problem.

Students coming to grade seven will have negligible skill with multiplying and dividing decimals. The same may be said for problem solving. The latter (problem solving) is perhaps of most concern particularly since one of the major goals of mathematics programs should be to facilitate the solution of problems.

### Measurement

It is perhaps understandable that the grade six pupils would have difficulty with the interrelationships item in Figure 178. They have lacked success with virtually every aspect of the Metric System up to grade six so to expect them to put it all together seems absurd.

The lack of student success on the scale items is likely due to a combination of factors. It is difficult to test scale for example without bringing in many other factors such as understanding the units and measuring.

The results from the volume items in Figure 175 do not support the notion that volume is taught primarily with the formula. Grade four pupils did better on their volume test which was designed so that they could count blocks.



### Geometry

The achievement gains made in 1979 over 1978 appear to indicate an increase in the time allotted to the geometry strand.

Question 19 in Figure 182 seems it test more than what the objective calls for.

### Graphing

The data associated with the two grade six graphing objectives given in Figure 183 and 184 again suggests that pupils can better identify than write ordered pairs.



## CHAPTER X

### ANALYSIS OF THE DEMOGRAPHIC VARIABLES AND THE QUESTIONNAIRE; THE ACHIEVEMENT PROFILES

#### A. INTRODUCTION

The analyses of the demographic variables, which are in essence hypothesis three through six, are based on a series of F-tests. These tests check for differences between the achievement of students who belong to various subgroups. The subgroup classifications are male versus female, North Zone verses South Zone and Public School verses Separate School.

Each subgroup mean score was formed from the composite achievement of all students in the subgroup on all objectives within the five strands. The statistical data relating to each subgroup performance on the individual objectives for both 1978 and 1979 are included in the analysis sections of Chapters IV through IX. The comparisons there however are between the same subgroup in the two testing years.

Figures 185 to 190 in this chapter are used for clarification purposes and also to reduce the volume of reporting. With four sets of variables, five mathematics strands and six grades the latter aspect is of some importance. The format of these figures is such that any significant differences between subgroups can be viewed within the cell structure of the charts, grades one to six.



As for the previous analyses, a subgroup difference must have a probability level of less than 0.02 in order to be considered significant.

It should be noted that the Northlands School Division participated in the testing program at the grade two, four and five levels only. As both North Zone and Public School participants their influence on the subgroup performance may be significant.

As noted in the literature section of this study, pupil achievement in the Northland schools is likely affected by many conditions. Actual time in which pupils have been in contact with the mathematics content due to attendance problems is one real possibility. Supervisory adjustments to the Alberta Program of Studies (1978) is another. Such factors as teacher mobility and the sociological-environmental conditions may also have an influence on achievement. Also, the majority of students entering grade one do not have English as a first language.

## **B. RESTATEMENT OF THE HYPOTHESIS**

### Hypothesis Three

There will be no significant differences in mathematics achievement between the early and late starters in 1978 and 1979 on each of the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one through six.



#### Hypothesis Four

There will be no significant differences in mathematics achievement between boys and girls in 1978 and 1979 on each of the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one through six.

#### Hypothesis Five

There will be no significant difference in mathematics achievement between North and South Zone students in 1978 and 1979 on each of the five strands in grades one through six.

#### Hypothesis Six

There will be no significant difference in mathematics achievement between Public and Separate school students in 1978 and 1979 on each of the five strands in grades one through six.

### **C. DISCUSSION FROM THE RESULTS**

#### Grade One

The data in Tables 23 and 24 indicate that the performance of the subgroups was fairly stable over the two years. Achievement means for all subgroups are relatively high. The female subgroup was the only one to dominate over its rival with any consistency. One-half of all cells reporting significant differences (Figure 185) belong to the girls.

#### Grade Two

With the exception of the 1978 achievement figures in



TABLE 23

COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE ONE NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS									
GRADE: 1			STRAND: NUMBER						
YEAR	SUBGROUP		#	F-TEST TABLE					
				SS		DF		F-RATIO	PROB
=====	=====	=====	BETWEEN	WITHIN	BETWEEN	WITHIN			
	EARLY	LATE	#						
1978	86.89	83.06	#	308.34	383791.63	1	2040	1.639	0.201
1979	89.44	87.84	#	1005.23	354299.47	1	1738	4.931	0.027
	MALE	FEMALE	#						
1978	83.29	88.92	#	212.25	409750.85	1	2124	1.100	0.295
1979	88.10	89.71	#	1197.53	374996.97	1	1844	5.889	0.015
	NORTH	SOUTH	#						
1978	89.59	86.20	#	826.38	409136.72	1	2124	4.290	0.038
1979	89.95	88.48	#	770.87	375423.63	1	1844	3.786	0.052
	PUBLIC	SEPARATE	#						
1978	88.56	88.72	#	9.03	409954.07	1	2124	0.047	0.229
1979	89.07	88.10	#	287.73	375906.76	1	1844	1.411	0.235

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS									
GRADE: 1			STRAND: OPERATIONS & PROPERTIES						
F-TEST TABLE									
YEAR	SUBGROUP		#	SS		DF			
			#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	84.69	83.89	#	297.11	749472.65	1	2040	0.809	0.369
1979	86.02	84.17	#	1337.75	563729.32	1	1738	4.124	0.043
	MALE	FEMALE	#						
1978	82.96	85.98	#	4815.07	783897.01	1	2124	13.047	0.000
1979	83.46	87.32	#	6859.52	599296.41	1	1844	21.106	0.000
	NORTH	SOUTH	#						
1978	85.22	84.10	#	545.21	788166.86	1	2124	1.469	0.226
1979	85.35	85.27	#	2.67	606153.26	1	1844	0.008	0.928
	PUBLIC	SEPARATE	#						
1978	83.98	86.20	#	1630.73	787081.35	1	2124	4.401	0.036
1979	85.15	85.81	#	134.79	606021.13	1	1844	0.410	0.522

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS									
GRADE: 1			STRAND: MEASUREMENT						
YEAR	SUBGROUP		#	F-TEST TABLE					
				SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
1978	EARLY	LATE	#						
1978	85.02	82.22	#	1495.55	486955.06	1	2040	6.265	0.012
1979	84.50	83.26	#	933.85	542025.09	1	1738	2.994	0.084
1978	MALE	FEMALE	#						
1978	83.92	84.78	#	389.96	515680.48	1	2124	1.606	0.205
1979	83.47	84.67	#	663.36	578654.05	1	1844	2.113	0.146
1978	NORTH	SOUTH	#						
1978	85.18	84.01	#	586.19	515484.25	1	2124	2.415	0.120
1979	86.20	83.27	#	3044.49	576472.92	1	1844	9.739	0.002
1978	PUBLIC	SEPARATE	#						
1978	84.59	83.28	#	564.20	515506.25	1	2124	2.325	0.123
1979	84.73	81.50	#	3233.22	576284.19	1	1844	10.346	0.001



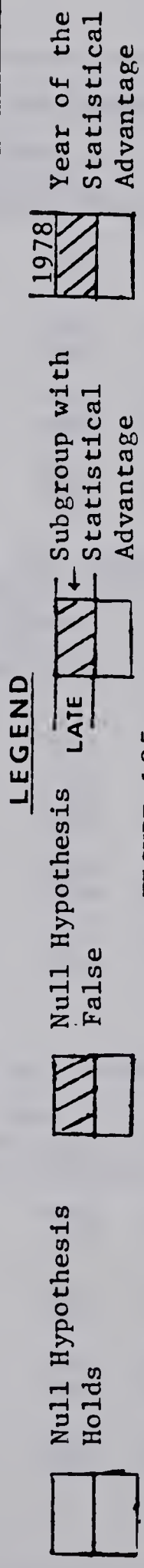
TABLE 24  
COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE ONE GEOMETRY AND GRAPHING

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS									
GRADE: 1			STRAND: GEOMETRY						
F-TEST TABLE									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	PROB
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
	EARLY	LATE	#						
1978	90.87	89.69	#	641.87	503620.80	1	2040	2.600	0.107
1979	90.16	90.23	#	1.78	546187.52	1	1738	0.006	0.940
	MALE	FEMALE	#						
1978	90.27	90.74	#	115.84	522955.66	1	2124	0.470	0.493
1979	89.60	90.70	#	564.43	571290.00	1	1844	1.822	0.177
	NORTH	SOUTH	#						
1978	89.94	90.72	#	260.60	522810.89	1	2124	1.059	0.304
1979	91.06	89.79	#	574.48	571279.95	1	1844	1.854	0.174
	PUBLIC	SEPARATE	#						
1978	90.76	89.41	#	604.02	522467.47	1	2124	2.456	0.117
1979	90.63	88.23	#	1790.89	570063.54	1	1844	5.793	0.016

COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS									
GRADE: 1			STRAND: GRAPHING						
F-TEST TABLE									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	PROB
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN		
	EARLY	LATE	#						
1978	79.19	77.57	#	1218.78	1737341.85	1	2040	1.431	0.232
1979	80.31	77.21	#	3773.18	1486855.55	1	1738	4.411	0.036
	MALE	FEMALE	#						
1978	76.78	80.55	#	7553.26	1907413.44	1	2124	0.876	0.003
1979	77.94	81.21	#	4922.15	1562199.19	1	1844	5.810	0.016
	NORTH	SOUTH	#						
1978	79.36	78.29	#	492.99	1814473.71	1	2124	0.577	0.443
1979	81.58	78.75	#	2839.39	1564281.95	1	1844	3.347	0.068
	PUBLIC	SEPARATE	#						
1978	78.30	79.81	#	756.79	1814209.90	1	2124	0.886	0.347
1979	78.51	83.10	#	6512.23	1560609.11	1	1844	7.695	0.006



THE STRANDS										
THE HYPOTHESIS	NUMBER		OPER. & PROP.		MEASUREMENT		GEOMETRY		GRAPHING	
	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
EARLY	3									
LATE										
MALE	4									
FEMALE										
NORTH	5									
SOUTH										
PUBLIC	6									
SEPARATE										



A CHART INDICATING WHICH SUBGROUPS IN GRADE 1 HAVE STATISTICALLY HIGHER ACHIEVEMENT



TABLE 25  
COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE TWO NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 2			STRAND: NUMBER						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	84.74	86.74	#	1954.75	461281.88	1	2233	9.463	0.002
1979	85.33	85.98	#	187.96	430487.40	1	1954	0.853	0.356
	MALE	FEMALE	#						
1978	84.80	86.05	#	897.12	473680.49	1	2301	4.358	0.037
1979	85.29	85.79	#	127.78	448867.14	9	2068	0.589	0.443
	NORTH	SOUTH	#						
1978	82.30	87.20	#	12807.90	461769.71	1	2301	63.822	0.000
1979	82.89	86.82	#	7028.42	441966.49	1	2068	32.887	0.000
	PUBLIC	SEPARATE	#						
1978	85.32	85.87	#	99.08	474478.53	1	2301	0.480	0.488
1979	85.09	87.56	#	1858.48	447136.43	1	2068	8.595	0.003

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 2			STRAND: OPERATIONS & PROPERTIES						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	65.48	66.58	#	584.50	1185174.93	1	2233	1.101	0.294
1979	68.31	67.94	#	59.60	913346.03	1	1954	0.128	0.721
	MALE	FEMALE	#						
1978	64.58	67.58	#	5173.07	1208988.45	1	2301	9.846	0.002
1979	66.81	69.55	#	3885.35	967306.03	1	2068	8.306	0.004
	NORTH	SOUTH	#						
1978	64.86	66.72	#	1843.76	1212317.76	1	2301	3.499	0.062
1979	65.61	69.39	#	6529.88	964661.51	1	2068	13.998	0.000
	PUBLIC	SEPARATE	#						
1978	66.36	64.44	#	1199.87	1212961.65	1	2301	2.276	0.132
1979	67.58	70.77	#	3110.46	968080.93	1	2068	6.645	0.010

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 2			STRAND: MEASUREMENT						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	69.34	71.08	#	1472.98	942337.39	1	2233	3.490	0.062
1979	73.42	73.26	#	10.51	675446.82	1	1954	0.030	0.862
	MALE	FEMALE	#						
1978	68.58	71.41	#	4606.01	969167.71	1	2301	10.936	0.001
1979	73.07	73.94	#	390.99	723921.46	1	2068	1.117	0.291
	NORTH	SOUTH	#						
1978	65.75	72.38	#	23500.21	950273.51	1	2301	56.904	0.000
1979	70.50	74.95	#	9028.57	715283.88	1	2068	26.103	0.000
	PUBLIC	SEPARATE	#						
1978	69.75	70.98	#	490.86	973282.86	1	2301	1.160	0.282
1979	72.41	78.46	#	11183.13	713129.33	1	2068	32.430	0.000



TABLE 26  
COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE TWO GEOMETRY AND GRAPHING

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 2			STRAND: GEOMETRY						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VALUE
	EARLY	LATE	#						
1978	74.67	74.44	#	25.51	1223901.38	1	2233	0.047	0.829
1979	77.11	77.43	#	45.23	921623.28	1	1954	0.096	0.757
	MALE	FEMALE	#						
1978	73.84	75.91	#	2476.29	1247748.46	1	2301	4.567	0.033
1979	76.39	78.42	#	2120.73	979269.71	1	2068	4.479	0.034
	NORTH	SOUTH	#						
1978	73.27	75.76	#	3333.01	1246891.73	1	2301	6.151	0.013
1979	77.56	77.30	#	31.99	981358.45	1	2068	0.067	0.795
	PUBLIC	SEPARATE	#						
1978	74.51	76.51	#	1285.11	1248939.64	1	2301	2.368	0.124
1979	76.80	80.08	#	3293.24	978097.20	1	2068	6.963	0.008

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 2			STRAND: GRAPHING						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	P-VALUE
	EARLY	LATE	#						
1978	75.68	78.09	#	2838.71	2149556.38	1	2233	2.949	0.086
1979	79.73	80.47	#	242.87	1621804.61	1	1954	0.293	0.589
	MALE	FEMALE	#						
1978	75.78	77.90	#	2570.99	2200832.54	1	2301	2.688	0.101
1979	79.55	80.33	#	313.19	1711101.03	1	2068	0.379	0.538
	NORTH	SOUTH	#						
1978	71.39	79.94	#	39110.31	2164293.21	1	2301	41.581	0.000
1979	73.07	83.28	#	47480.54	1663933.68	1	2068	59.011	0.000
	PUBLIC	SEPARATE	#						
1978	75.64	82.61	#	15661.43	2187742.09	1	2301	16.472	0.000
1979	78.47	86.63	#	20331.04	1691083.18	1	2068	24.863	0.000



THE STRANDS										
THE HYPOTHESIS	NUMBER		OPER. & PROP.		MEASUREMENT		GEOMETRY		GRAPHING	
	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
EARLY	3									
LATE										
MALE	4									
FEMALE										
NORTH	5									
SOUTH										
PUBLIC	6									
SEPARATE										

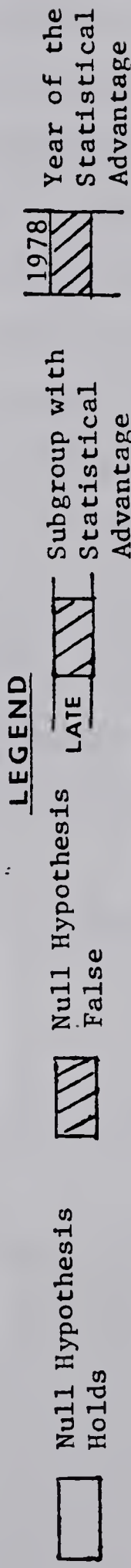


FIGURE 186

A CHART INDICATING WHICH SUBGROUPS IN GRADE 2 HAVE STATISTICALLY HIGHER ACHIEVEMENT



Number, where the late starters do better, the performances of the early and late starters run quite parallel.

The statistics in Tables 25 and 26 indicate a stronger performance for girls in the Operations and Properties objectives. The Chapter V analysis of the individual objectives underscores the female strength in that they record higher achievement scores on each of the objectives. Figure 186 indicates that the girls lost their grade one achievement advantage in the Number and Graphing strands but were significantly superior in Measurement for 1978 only.

The South Zone students do significantly better for eight of ten possible comparisons. As noted earlier the Northland School Division participated in the grade two testing for both 1978 and 1979 and this may have influenced both the North-South and the Public-Separate statistics. (Note the possible reasons on page 322).

Clearly the Separate school students in grade two show the greatest gains for 1979.

### Grade Three

No differences exist between the early and late starter subgroups at the grade three level.

There are however significant differences between boys and girls for both 1978 and 1979 on the Operations and Properties strand and on the 1978 Measurement strand.

From the grade three analysis of the individual objectives it is clear that girls show the greatest advantages over boys in their understanding of the basic



TABLE 27

COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE THREE NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 3			STRAND: NUMBER						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FFCB
	EARLY	LATE	#						
1978	70.27	70.21	#	1.47	906793.88	1	1887	0.003	0.956
1979	71.61	71.66	#	1.02	784694.63	1	1755	0.002	0.962
	MALE	FEMALE	#						
1978	69.77	70.55	#	286.71	919047.85	1	1910	0.596	0.440
1979	72.27	71.49	#	273.68	804369.87	1	1808	6.615	0.433
	NORTH	SOUTH	#						
1978	72.78	69.17	#	4894.04	914440.51	1	1910	10.222	0.001
1979	67.55	73.40	#	11857.05	792786.50	1	1808	27.041	0.000
	PUBLIC	SEPARATE	#						
1978	70.31	69.52	#	202.81	919131.74	1	1910	0.421	0.516
1979	72.67	68.91	#	4206.33	800437.22	1	1808	9.501	0.002

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 3			STRAND: OPERATIONS & PROPERTIES						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FFCB
	EARLY	LATE	#						
1978	72.33	74.20	#	1454.30	637888.39	1	1887	4.302	0.038
1979	72.42	71.88	#	111.05	573377.42	1	1755	0.340	0.560
	MALE	FEMALE	#						
1978	71.39	74.46	#	4494.93	648099.50	1	1910	13.247	0.000
1979	71.41	73.59	#	2155.72	584312.13	1	1808	6.670	0.010
	NORTH	SOUTH	#						
1978	73.74	72.54	#	537.96	652056.47	1	1910	1.576	0.210
1979	68.97	73.62	#	7692.39	578775.51	1	1808	24.030	0.000
	PUBLIC	SEPARATE	#						
1978	73.54	70.36	#	3224.69	649369.74	1	1910	9.485	0.002
1979	72.65	71.76	#	233.59	586234.32	1	1808	0.720	0.396

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 3			STRAND: MEASUREMENT						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	FFCB
	EARLY	LATE	#						
1978	67.16	68.26	#	502.06	766445.89	1	1887	1.236	0.266
1979	68.07	69.79	#	1152.29	772966.32	1	1755	2.616	0.106
	MALE	FEMALE	#						
1978	66.06	68.79	#	3557.01	777465.24	1	1910	8.739	0.003
1979	68.12	69.45	#	792.73	796951.55	1	1808	1.798	0.180
	NORTH	SOUTH	#						
1978	67.86	67.20	#	166.09	780856.16	1	1910	0.406	0.524
1979	65.25	69.99	#	7782.99	789961.29	1	1808	17.813	0.000
	PUBLIC	SEPARATE	#						
1978	67.75	65.99	#	987.97	780034.28	1	1910	2.419	0.120
1979	68.37	70.29	#	1095.33	796648.95	1	1808	2.486	0.115



TABLE 28

COMPARISON OF SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE THREE GEOMETRY AND GRAPHING

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 3			STRAND: GEOMETRY						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	=====	=====
	EARLY	LATE	#						
1978	73.53	74.25	#	214.43	772528.27	1	1887	0.524	0.465
1979	73.10	74.29	#	551.76	817363.00	1	1755	1.185	0.277
	MALE	FEMALE	#						
1978	73.14	73.86	#	243.67	798273.75	1	1910	0.584	0.445
1979	73.41	73.97	#	140.67	839740.94	1	1808	0.303	0.582
	NORTH	SOUTH	#						
1978	76.06	72.54	#	4665.80	793851.82	1	1910	11.226	0.001
1979	70.86	74.67	#	5029.93	834851.69	1	1808	10.893	0.001
	PUBLIC	SEPARATE	#						
1978	74.40	70.09	#	5914.95	792602.67	1	1910	14.254	0.000
1979	73.00	76.30	#	3230.46	836651.15	1	1808	6.981	0.008

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 3			STRAND: GRAPHING						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	=====	=====
	EARLY	LATE	#						
1978	64.66	64.63	#	0.28	1435503.94	1	1887	0.000	0.985
1979	70.86	72.20	#	691.94	1197672.76	1	1755	1.014	0.314
	MALE	FEMALE	#						
1978	63.51	65.67	#	2224.22	1455529.94	1	1910	2.919	0.088
1979	70.43	72.71	#	2339.97	1238428.86	1	1808	3.416	0.065
	NORTH	SOUTH	#						
1978	68.68	63.02	#	12048.30	1445705.85	1	1910	15.918	0.000
1979	69.18	72.36	#	3505.04	1237263.80	1	1808	5.122	0.024
	PUBLIC	SEPARATE	#						
1978	65.89	59.55	#	12812.95	1444941.20	1	1910	16.937	0.000
1979	71.86	70.28	#	750.80	1240018.03	1	1808	1.095	0.296



THE HYPOTHESIS	THE STRANDS										
	NUMBER 1978 1979		OPER. & PROP. 1978 1979		MEASUREMENT 1978 1979		GEOMETRY 1978 1979		GRAPHING 1978 1979		
EARLY	3										
LATE											
MALE	4										
FEMALE											
NORTH	5										
SOUTH											
PUBLIC	6										
SEPARATE											

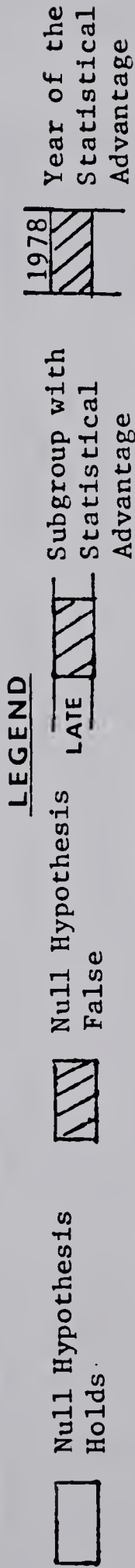


FIGURE 187

A CHART INDICATING WHICH SUBGROUPS IN GRADE 3 HAVE STATISTICALLY HIGHER ACHIEVEMENT



facts and in their performance with the addition and subtraction algorithms. It appears as though the girls have committed more of the basic facts to memory than the boys have.

It is interesting to note that the North Zone students do better than the South in three strands for 1978 but none in 1979. The South zone pupils significantly outperform the North on four of the five strands in 1979.

The Public school students outperformed the Separate students in four strands (3 in 1978). The Separate pupils were superior in only one, that of Geometry for 1979.

#### Grade Four

It is interesting to note from Tables 29 and 30 that being older than 6.0 years at school entry offers a significant and consistent advantage beginning at the grade four level.

Again the female students record significantly higher achievement scores than boys on the Operations and Properties strand. Indeed this is the case for all ten of the objectives that make up the strand (Chapter VII). Girls also outperform the boys in Number for 1978 and Geometry for 1979.

Performance comparisons for the grade four North and South Zone pupils are similar to those from the grade two level except here all comparisons are significant.

The data from Tables 29 and 30 and from grades two, three and four indicates that Separate school pupils made



FIGURE 29

COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE FOUR NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----  
GRADE: 4 STRAND: NUMBER

YEAR	SUBGROUP		#	F-TEST TABLE					
				SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	=====	=====	#						
	EARLY	LATE	#						
1978	43.88	49.08	#	12036.29	1277382.01	1	2073	19.533	0.000
1979	50.20	57.37	#	22087.42	1256978.52	1	1925	33.826	0.000
	MALE	FEMALE	#						
1978	45.21	45.98	#	313.63	1305793.35	1	2113	0.508	0.476
1979	50.90	54.28	#	5593.59	1292831.43	1	1967	8.510	0.004
	NORTH	SOUTH	#						
1978	40.52	48.52	#	31429.51	1274677.07	1	2113	52.101	0.000
1979	42.95	57.43	#	92928.51	1205496.51	1	1967	151.631	0.000
	PUBLIC	SEPARATE	#						
1978	46.68	40.77	#	11133.45	1294973.53	1	2113	18.166	0.000
1979	52.22	53.54	#	543.67	1297881.35	1	1967	0.824	0.364

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----  
GRADE: 4 STRAND: OPERATIONS & PROPERTIES

YEAR	SUBGROUP		#	F-TEST TABLE					
				SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	=====	=====	#						
	EARLY	LATE	#						
1978	52.64	57.34	#	9812.79	1123162.05	1	2073	18.111	0.000
1979	54.33	60.20	#	14834.05	1005408.75	1	1925	28.402	0.000
	MALE	FEMALE	#						
1978	52.48	56.00	#	6555.31	1151255.73	1	2113	12.032	0.001
1979	53.77	59.05	#	13668.64	1022024.45	1	1967	26.307	0.000
	NORTH	SOUTH	#						
1978	48.98	57.19	#	33095.60	1124715.43	1	2113	62.177	0.000
1979	48.85	60.07	#	55226.88	979866.21	1	1967	112.068	0.000
	PUBLIC	SEPARATE	#						
1978	55.43	48.67	#	14565.74	1143245.29	1	2113	26.921	0.000
1979	56.53	55.04	#	692.80	1035000.29	1	1967	1.317	0.251

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----  
GRADE: 4 STRAND: MEASUREMENT

YEAR	SUBGROUP		#	F-TEST TABLE					
				SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	=====	=====	#						
	EARLY	LATE	#						
1978	43.93	48.02	#	7434.58	949395.50	1	2073	16.233	0.000
1979	48.50	53.34	#	10031.49	936030.21	1	1925	20.630	0.000
	MALE	FEMALE	#						
1978	46.31	44.31	#	2092.70	974841.27	1	2113	4.536	0.033
1979	50.38	49.93	#	99.24	957576.95	1	1967	0.204	0.652
	NORTH	SOUTH	#						
1978	41.46	47.59	#	18492.92	958441.05	1	2113	40.770	0.000
1979	44.32	53.21	#	35036.68	922639.51	1	1967	74.696	0.000
	PUBLIC	SEPARATE	#						
1978	46.39	40.72	#	10244.50	966689.47	1	2113	22.393	0.000
1979	50.52	48.73	#	993.05	956683.14	1	1967	2.042	0.153



TABLE 30

COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE FOUR GEOMETRY AND GRAPHING

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 4			STRAND: GEOMETRY						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	N	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
	EARLY	LATE	#						
1978	56.24	59.62	#	5084.51	1841742.60	1	2073	5.723	0.017
1979	61.26	67.17	#	15004.66	1747888.46	1	1925	16.525	0.000
	MALE	FEMALE	#						
1978	55.93	59.01	#	5006.77	1872530.50	1	2113	5.650	0.018
1979	62.51	64.67	#	2282.28	1795065.32	1	1967	2.501	0.114
	NORTH	SOUTH	#						
1978	53.98	59.41	#	14468.94	1863068.32	1	2113	16.410	0.000
1979	55.10	67.90	#	72512.24	1724835.36	1	1967	82.693	0.000
	PUBLIC	SEPARATE	#						
1978	56.18	54.05	#	5431.43	1872105.84	1	2113	6.130	0.013
1979	63.67	62.91	#	181.80	1797165.80	1	1967	0.199	0.656

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 4			STRAND: GRAPHING						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	N	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
	EARLY	LATE	#						
1978	62.47	67.69	#	12069.64	1503350.56	1	2073	16.643	0.000
1979	66.99	73.79	#	19851.59	1342961.23	1	1925	28.455	0.000
	MALE	FEMALE	#						
1978	63.00	65.34	#	2894.72	1540034.10	1	2113	3.972	0.046
1979	68.43	70.62	#	2357.87	1379400.15	1	1967	3.362	0.067
	NORTH	SOUTH	#						
1978	59.26	66.94	#	28976.67	1513952.14	1	2113	40.442	0.000
1979	62.77	72.93	#	45677.56	1336080.46	1	1967	67.247	0.000
	PUBLIC	SEPARATE	#						
1978	65.56	57.00	#	19214.84	1523713.98	1	2113	26.646	0.000
1979	68.16	74.79	#	13642.15	1366115.87	1	1967	15.614	0.000



THE HYPOTHESIS	THE STRANDS									
	NUMBER		OPER. & PROP.		MEASUREMENT		GEOMETRY		GRAPHING	
	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
3 EARLY										
LATE										
4 MALE										
FEMALE										
5 NORTH										
SOUTH										
6 PUBLIC										
SEPARATE										

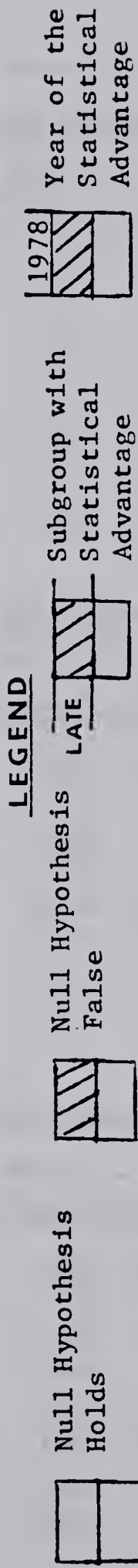


FIGURE 188

A CHART INDICATING WHICH SUBGROUPS IN GRADE 4 HAVE STATISTICALLY HIGHER ACHIEVEMENT



TABLE 31

COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE FIVE NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 5			STRAND: NUMBER						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	46.35	53.43	#	23016.92	1387306.21	1	2103	34.891	0.000
1979	51.38	54.89	#	4859.40	1100391.47	1	1763	7.786	0.005
	MALE	FEMALE	#						
1978	47.09	49.86	#	4077.83	1423582.34	1	2127	6.093	0.014
1979	53.19	52.78	#	78.66	1198869.78	1	1860	0.122	0.727
	NORTH	SOUTH	#						
1978	42.05	52.11	#	49908.49	1377751.68	1	2127	77.050	0.000
1979	48.48	55.51	#	21168.58	1177779.86	1	1860	33.430	0.000
	PUBLIC	SEPARATE	#						
1978	48.20	49.65	#	643.13	1427017.04	1	2127	0.959	0.328
1979	52.00	57.59	#	8477.46	1190470.98	1	1860	13.245	0.000

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 5			STRAND: OPERATIONS & PROPERTIES						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	56.32	62.31	#	16477.65	930779.43	1	2103	37.230	0.000
1979	58.74	61.86	#	3842.57	724357.08	1	1763	9.352	0.002
	MALE	FEMALE	#						
1978	55.58	60.77	#	14311.47	945040.34	1	2127	32.211	0.000
1979	58.65	61.27	#	3198.65	777978.07	1	1860	7.647	0.006
	NORTH	SOUTH	#						
1978	52.95	61.09	#	32663.24	926688.57	1	2127	74.971	0.000
1979	56.42	61.89	#	12828.73	768347.99	1	1860	31.056	0.000
	PUBLIC	SEPARATE	#						
1978	58.06	58.47	#	50.38	959301.43	1	2127	0.112	0.738
1979	59.72	60.93	#	394.98	780781.74	1	1860	0.941	0.332

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 5			STRAND: MEASUREMENT						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	53.63	59.79	#	17429.83	1051787.76	1	2103	34.850	0.000
1979	58.89	63.37	#	7926.56	785726.98	1	1763	17.785	0.000
	MALE	FEMALE	#						
1978	54.66	56.33	#	1474.53	1082797.92	1	2127	2.896	0.089
1979	60.51	60.66	#	10.00	861885.42	1	1860	0.022	0.883
	NORTH	SOUTH	#						
1978	50.17	58.51	#	34249.20	1050023.25	1	2127	69.378	0.000
1979	55.15	63.62	#	30664.48	831230.94	1	1860	68.616	0.000
	PUBLIC	SEPARATE	#						
1978	55.40	55.88	#	69.78	1084202.67	1	2127	0.137	0.711
1979	60.07	62.96	#	2267.74	859627.68	1	1860	4.907	0.027



TABLE 32  
COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE FIVE GEOMETRY AND GRAPHING

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 5			STRAND: GEOMETRY						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	=====	=====	#	=====	=====	=====	=====	=====	=====
	EARLY	LATE	#						
1978	54.24	60.27	#	16694.17	1609460.28	1	2103	21.813	0.000
1979	60.91	64.61	#	5382.76	1188058.01	1	1763	7.988	0.005
	MALE	FEMALE	#						
1978	53.70	58.47	#	12107.05	1636387.70	1	2127	15.737	0.000
1979	61.79	63.07	#	767.85	1274756.87	1	1860	1.120	0.290
	NORTH	SOUTH	#						
1978	50.84	59.01	#	32895.14	1615599.61	1	2127	43.308	0.000
1979	55.23	66.43	#	53711.37	1221813.36	1	1860	81.766	0.000
	PUBLIC	SEPARATE	#						
1978	55.91	56.68	#	183.66	1648311.09	1	2127	0.237	0.626
1979	61.60	66.18	#	5690.90	1269833.82	1	1860	8.336	0.004

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 5			STRAND: GRAPHING						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF		F-RATIO	PROB
				BETWEEN	WITHIN	BETWEEN	WITHIN		
=====	=====	=====	#	=====	=====	=====	=====	=====	=====
	EARLY	LATE	#						
1978	52.10	60.07	#	29154.96	1704245.15	1	2103	35.977	0.000
1979	60.68	66.65	#	14014.51	1218643.62	1	1763	20.275	0.000
	MALE	FEMALE	#						
1978	52.19	56.74	#	11018.91	1750159.03	1	2127	13.391	0.000
1979	61.61	64.36	#	3532.23	1311258.20	1	1860	5.010	0.025
	NORTH	SOUTH	#						
1978	47.59	58.34	#	56970.52	1704207.42	1	2127	71.104	0.000
1979	56.45	66.59	#	44072.16	1270718.28	1	1860	64.510	0.000
	PUBLIC	SEPARATE	#						
1978	54.18	55.61	#	621.44	1760556.50	1	2127	0.751	0.387
1979	62.04	67.24	#	7348.17	1307442.27	1	1860	10.454	0.001



THE STRANDS																				
THE HYPOTHESIS	3	EARLY	LATE	MALE	FEMALE	NORTH	SOUTH	PUBLIC	SEPARATE	NUMBER		OPER. & PROP.		MEASUREMENT		GEOMETRY		GRAPHING		
										1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978

Null Hypothesis Holds

Null Hypothesis False

Subgroup with Statistical Advantage

Year of the Statistical Advantage

LEGEND

1978

FIGURE 189

A CHART INDICATING WHICH SUBGROUPS IN GRADE 5 HAVE STATISTICALLY HIGHER ACHIEVEMENT



the largest gains in 1979. However the only significantly higher performance for the Separate school pupils was in Graphing for 1979. Public school pupils had all of their significantly superior strands in 1978.

### Grade Five

The trend of superior achievement for the late over the early starters that was started in grade four continues into level five. It was interesting to compare the grade four and grade five mean score differences between the 1978 and 1979 early and late starters (Chapter VIII). At grade five the 1978 late starters have the greatest advantage over their early starting counterparts. The advantage was reversed at the grade four level where the 1979 late starters had the larger percentage difference. This might suggest that the 1979 group of grade five early starters, who were the same group of 1978 early starters in grade four, may be superior to the early starters before this time. Early Childhood supporters might wish to note that this group of pupils was the first to be involved in the expansion of Early Childhood programs within the Zone.

Although the female students had some superior performances, over males most of these were in 1978; male students actually received higher but not significantly higher scores for 1979. The boys predominating weakness continues to be with their knowledge, skills and understanding within the Operations and Properties strand.

For each of grades two and four where the Northland



School Division were involved, the South Zone students received significantly higher mean scores. This pattern is continued for grade five.

The Separate school pupils had significantly higher 1979 test performances than did the Public school students in the Number, Geometry, and Graphing strands. This trend was noted for some of the previous grades.

### Grade Six

The data provided in Tables 33 and 34 and in the Chart Figure 190 again gives a significant achievement advantage to the late starter subgroup. Higher mean scores are recorded within each of the strands for 1978 and 1979 although the difference in the graphing strand was not significant.

The domain of concepts, skills and understandings within the Operations and Properties strand, belongs completely to the girls at all grades. On the specific objectives within the strand (Chapter IX) boys fare below the girls by an average of five percentage points for all but the problem solving objective. Here boys have a slight but not a significant advantage.

The achievement difference between the North and South Zone diminishes to the point where only two differences in 1978 are significant at the grade six level.

The grades four and six achievement profiles for the Public and Separate school pupils are almost identical. The trend at both levels was for the Public school pupils to



TABLE 33

COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR THE GRADE SIX NUMBER, OPERATIONS AND PROPERTIES,  
AND MEASUREMENT

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 6			STRAND: NUMBER						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	49.29	55.47	#	15231.12	1261375.37	1	1838	22.194	0.000
1979	58.48	65.36	#	17295.03	1022886.47	1	1572	26.579	0.000
	MALE	FEMALE	#						
1978	50.93	51.84	#	390.02	1315284.51	1	1895	0.562	0.454
1979	59.26	62.93	#	5594.19	1103513.74	1	1666	8.446	0.004
	NORTH	SOUTH	#						
1978	47.06	52.94	#	12838.72	1303435.81	1	1895	18.666	0.000
1979	60.06	61.43	#	623.71	1108484.22	1	1666	0.937	0.333
	PUBLIC	SEPARATE	#						
1978	52.24	47.81	#	5810.96	1310463.57	1	1895	8.403	0.004
1979	61.47	59.31	#	1211.32	1107896.61	1	1666	1.822	0.177

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 6			STRAND: OPERATIONS & PROPERTIES						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	57.13	62.23	#	10359.26	926558.07	1	1838	20.550	0.000
1979	60.76	64.66	#	5538.47	762460.15	1	1572	11.419	0.001
	MALE	FEMALE	#						
1978	56.70	61.24	#	9750.05	955735.83	1	1895	19.332	0.000
1979	59.48	64.68	#	11280.73	806776.90	1	1666	23.295	0.000
	NORTH	SOUTH	#						
1978	58.20	59.17	#	345.78	965140.10	1	1895	0.679	0.410
1979	61.83	62.10	#	25.41	818032.22	1	1666	0.052	0.820
	PUBLIC	SEPARATE	#						
1978	59.54	56.30	#	3116.15	962369.73	1	1895	6.136	0.013
1979	61.53	64.12	#	1749.61	816308.03	1	1666	3.571	0.059

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 6			STRAND: MEASUREMENT						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	-----	-----	-----	-----	-----	-----
				BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	PROB
	EARLY	LATE	#						
1978	39.76	44.18	#	7803.59	1217083.24	1	1838	11.785	0.001
1979	44.71	50.04	#	10379.08	1054378.49	1	1572	15.474	0.000
	MALE	FEMALE	#						
1978	41.64	40.39	#	734.12	1251879.08	1	1895	1.111	0.292
1979	46.59	46.20	#	63.37	1128639.36	1	1666	0.094	0.760
	NORTH	SOUTH	#						
1978	40.46	41.24	#	227.30	1252385.90	1	1895	0.344	0.558
1979	44.23	47.23	#	3007.74	1125694.99	1	1666	4.451	0.035
	PUBLIC	SEPARATE	#						
1978	42.16	36.36	#	9986.16	1242627.05	1	1895	15.229	0.000
1979	46.04	47.95	#	949.32	1127753.41	1	1666	1.402	0.237



TABLE 34

COMPARISON OF THE SUBGROUP MEAN SCORES IN ZONE ONE  
FOR GRADE SIX GEOMETRY AND GRAPHING

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 6			STRAND: GEOMETRY						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
	EARLY	LATE	#						
1978	51.29	55.04	#	5611.43	1376252.34	1	1838	7.494	0.006
1979	57.69	61.52	#	5338.08	1226275.82	1	1572	6.843	0.009
	MALE	FEMALE	#						
1978	53.40	51.77	#	1253.71	1410296.49	1	1895	1.685	0.195
1979	59.81	57.80	#	1680.53	1303104.33	1	1666	2.149	0.143
	NORTH	SOUTH	#						
1978	48.37	54.15	#	12381.56	1399168.65	1	1895	16.769	0.000
1979	58.11	59.10	#	327.47	1304457.38	1	1666	0.418	0.518
	PUBLIC	SEPARATE	#						
1978	53.39	49.36	#	4832.20	1406718.00	1	1895	6.509	0.011
1979	57.64	63.82	#	9904.54	1254880.31	1	1666	12.743	0.000

-----COMPARING THE MEAN SCORES OF PUPILS WITHIN ZONE ONE SUBGROUPS-----									
GRADE: 6			STRAND: GRAPHING						
-----F-TEST TABLE-----									
YEAR	SUBGROUP		#	SS		DF			
=====	=====	=====	#	BETWEEN	WITHIN	BETWEEN	WITHIN	F-RATIO	F-CR
	EARLY	LATE	#						
1978	66.01	69.33	#	4392.38	2311127.99	1	1838	3.493	0.062
1979	76.35	78.90	#	2360.01	1396770.66	1	1572	2.656	0.103
	MALE	FEMALE	#						
1978	66.49	67.45	#	436.76	2385256.88	1	1895	0.347	0.556
1979	76.81	76.94	#	6.09	1482819.77	1	1666	0.007	0.934
	NORTH	SOUTH	#						
1978	66.14	67.25	#	458.01	2385235.63	1	1895	0.364	0.547
1979	75.42	77.43	#	1348.05	1481477.81	1	1666	1.516	0.219
	PUBLIC	SEPARATE	#						
1978	68.13	62.07	#	10925.24	2374768.40	1	1895	6.718	0.003
1979	75.85	81.18	#	7367.18	1475458.68	1	1666	6.319	0.004



THE STRANDS										
THE HYPOTHESIS	NUMBER		OPER. & PROP.		MEASUREMENT		GEOMETRY		GRAPHING	
	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
EARLY	3									
LATE										
MALE	4									
FEMALE										
NORTH	5									
SOUTH										
PUBLIC	6									
SEPARATE										

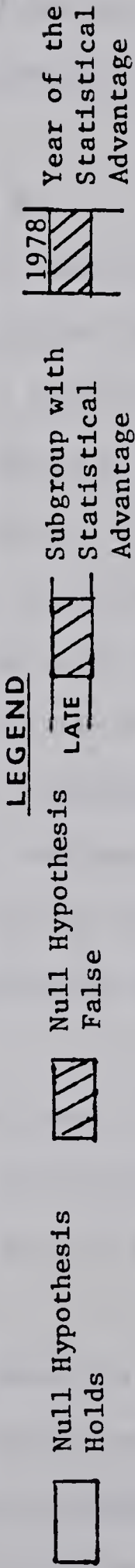


FIGURE 190

A CHART INDICATING WHICH SUBGROUPS IN GRADE 6 HAVE STATISTICALLY HIGHER ACHIEVEMENT



have significantly higher mean scores in 1978 with the Separate school pupils making the greater gains for 1979. For the Geometry and Graphing strands in grade six, the achievement picture for 1978 and 1979 is reversed.

#### **D. ANALYSIS OF THE QUESTIONNAIRE (Appendix B)**

The Pearson-product-moment correlation coefficient was calculated between years of teaching experience and the ranking items from parts one and two of the questionnaire. For any correlation to be significant the Pearson coefficient had to reach at least the 0.5 level.

There were however no significant correlations between the years of teaching experience in the Zone and the likelihood of teachers choosing a particular factor. One reason for failing to obtain a significant correlation may have been the splitting of the sample into too many parts. Not only were teachers separated by grade level but also into ten experience categories. This predestined many of the cells to zero.

Section three of the questionnaire was not a ranking item. The Eta-squared test was utilized here to see if teaching experience was related to the choice of a particular factor.

Eta is a measure of association used when the independent variable is nominal level and the dependent variable is interval or ratio level. It is an asymmetric statistic that indicates how dissimilar the scores of the



dependent variable (teaching experience) are within the categories of the independent variables (responses to factors). Eta-squared is interpreted as the proportion of variance in the dependent variable accounted for by the independent variable.

#### E. SECTION ONE OF THE QUESTIONNAIRE

The following factors were listed for teachers to rank as the most likely to be responsible for students within their school system not achieving within the 85-100 percent category. The numbering of the factors follows those of the actual questionnaire.

4. There is a lack of good materials for teaching certain objectives.
5. Textbooks do not match the program objectives.
6. The program objectives for my grade level are too difficult.
7. The test items for my grade level are too difficult.
8. The varied abilities of my students makes instruction difficult.
9. The sequencing of content in our textbook is inappropriate.
10. Keeping track of failure and successes and subsequent follow-up is too difficult.
11. Students fail to master objective because of inadequate learning skills (e.g., forgetting).



## F. SECTION TWO OF THE QUESTIONNAIRE

Teachers were asked to rank the following factors as the most important to the least important contributors to a successful mathematics program for any school.

12. A instructional plan involving good teachable materials.
13. Textbooks that students like and which cover the program objectives.
14. A management plan that includes help for marking and ways and means of keeping track and following up with students.
15. A program that is geared to the ability levels of all children.
16. A classroom of children grouped so that their needs, abilities and interests are alike.
17. The professional training of the teachers in our system.
18. The continuous (inservice) education of teachers in our system in mathematics.

## G. SECTION THREE OF THE QUESTIONNAIRE

The third section of the questionnaire dealt with the composite achievement of Zone One students who were tested in June of 1978. Figure 191 contains the lowest mean scores that were recorded within each strand for grades one through



six. Teachers were asked to respond from the perspective of one particular grade and to choose one of the factors A-F as being primarily responsible for the score listed.

The factors from which teachers were to respond to by strand are listed below.

- A. Students traditionally have difficulty with this topic.
- B. The topic is new. Understanding will grow with teacher familiarity.
- C. Students have not mastered previous concepts upon which this concept is dependent.
- D. Instructional materials are lacking in this area.
- E. This topic would not receive the instructional emphasis required for mastery.
- F. This concept is beyond the ability of children at this particular grade level.

#### **H. REPORTING OF THE QUESTIONNAIRE FINDING**

As in the previous reporting sections of this study the findings will be given by grade level.

The column totals from the tables that follow will be used in choosing two most important and two least important factors from each of sections one and two of the questionnaire. The two highest and the two lowest column totals were used for determining the most and least



<u>Grade One</u>				
<u>Number</u> 5.Actually tests ob- jective 6.renaming 72.7%	<u>Oper. &amp; Prop.</u> 2.Symbolizes addit. & subt. sit. 73.9%	<u>Measurement</u> 6.Recognizes coins & other values 68.3%	<u>Geometry</u>  <u>Mastery</u>	<u>Graphing</u> 1. <u>Graphing</u> data 78.6%
<u>Grade Two</u>				
<u>Number</u> 5.place value 65.1%	<u>Oper. &amp; Prop.</u> 5.Solves pic- ture & word problems 50.0%	<u>Measurement</u> 4.Months in order 49.2%	<u>Geometry</u> 3.Geometric pattern 75.0%	<u>Graphing</u> 1.Construct bar & pictograph 69.4%
<u>Grade Three</u>				
<u>Number</u> 4.place value 45.4	<u>Oper. &amp; Prop.</u> 9.solves word problems 56.0%	<u>Measurement</u> 9.linear meas. to tenths 38.2%	<u>Geometry</u> 4.Correspond- ing parts 48.8%	<u>Graphing</u> 1.the axis 48.1%
<u>Grade Four</u>				
<u>Number</u> 8.tenths hundredths 9.6%	<u>Oper. &amp; Prop.</u> 3.Rounding 37.0%	<u>Measurement</u> 9.linear meas. to hundredths 12.8%	<u>Geometry</u> 2.Axis of symmetry 44.4%	<u>Graphing</u> 4.ordered pairs 45.6%
<u>Grade Five</u>				
<u>Number</u> 3.place value to 0.001 36.4%	<u>Oper. &amp; Prop.</u> 6.Solve word problems 35.0%	<u>Measurement</u> 9.equivalent measures 27.2%	<u>Geometry</u> 2.Correspond- ing parts 38.2%	<u>Graphing</u> 4.radius diam. & circum- ferences 41.8%
<u>Grade Six</u>				
<u>Number</u> 3.decimals & expanded notation 40.1%	<u>Oper. &amp; Prop.</u> 6.Mult. & divides decimals 35.5	<u>Measurement</u> 6.interrela- tionships 25.9	<u>Geometry</u> 3.Constructs 3-D figures 43.7	<u>Graphing</u> 2.ordered pairs 59.9

FIGURE 191

LOWEST 1978 ACHIEVEMENT SCORES  
GRADES ONE TO SIX BY STRAND



important factors according to the teachers. Only the most frequent choice from section three will be listed as contributing to the lowest score by strand and grade level, that is unless two factors were given an equal rating.

### Grade One

According to the grade one teachers the factors contributing to the lack of achievement within their respective school system in terms of students not reaching Category D (85-100 percent) are:

#### Most likely

- 5. Textbooks do not match the program objectives.
- 11. Students fail to master objectives because of inadequate learning skills (eg. forgetting).

#### Least likely

- 7. The test items for my grade level are too difficult.
- 6. The program objectives for my grade level are too difficult.

Concerning those factors which should contribute to a successful mathematics program grade one teachers choose the following:

#### Most important

- 12. An instructional plan involving good teachable materials.
- 15. A program that is geared to the ability levels of all children.

#### Least important

- 17. The professional training of the teachers in our



system.

16. A classroom of children grouped so that their needs, abilities and interests are alike.

Grade one teachers gave the following reasons for the low achievement scores that are recorded for grade one pupils in Figure 191.

#### Number

- C. Students have not mastered previous concepts upon which this oncept is dependent.

#### Operations and Properties

- C. Students have not mastered previous concepts upon which this concept was dependent.

#### Measurement

- F. This concept is beyond the ability of children at this particular grade level.

#### Geometry Mastery Performance

#### Graphing

- E. This topic would not receive the instructional emphasis required for mastery.

### Grade Two

Grade two teachers gave the following reasons for the children in their school system not reaching the 85-100 percent achievement category.

#### Most likely

11. Student fail to master objectives because of inadequate learning skills (eg. forgetting).



TABLE 35

# FREQUENCY OF GRADE ONE TEACHERS IN EXPERIENCE CATEGORIES; CHOOSING FACTORS THAT INFLUENCE NON-MASTERY PERFORMANCE

GRADE: ONE STATEMENT: 5. Textbooks do not match the program objectives.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	MOST LIKELY. . . . .								LEAST LIKELY	#	ROW
		1	2	3	4	5	6	7	8			TOTALS
1	#	1	0	0	0	1	0	1	0	#		3
2	#	3	0	1	1	2	1	0	0	#		8
3	#	0	0	1	1	0	0	0	1	#		3
4	#	1	0	1	0	0	0	0	0	#		2
5	#	1	4	0	0	0	0	0	0	#		5
6	#	0	1	0	0	0	0	1	1	#		3
7	#	0	0	0	0	0	0	0	1	#		1
8	#	1	0	0	0	0	1	0	0	#		2
9	#	0	1	0	0	0	0	0	0	#		1
>= 10	#	4	3	1	1	0	4	1	0	#		14
=====												
COLUMN TOTALS	#	11	9	4	3	3	6	3	3	#		42

Pearson r = -0.022 r-squared = 0.000

GRADE: ONE STATEMENT: 11. Students fail to master objectives because of inadequate learning skills (e.g., forgetting).  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	MOST LIKELY. . . . .								LEAST LIKELY	#	ROW
		1	2	3	4	5	6	7	8			TOTALS
1	#	0	1	0	0	1	0	0	1	#		3
2	#	2	1	0	1	3	0	0	1	#		8
3	#	0	1	1	0	1	0	0	0	#		3
4	#	0	1	0	1	0	0	0	1	#		3
5	#	2	1	1	1	1	0	0	0	#		6
6	#	1	1	0	0	1	0	0	0	#		3
7	#	0	0	0	0	1	0	0	0	#		1
8	#	0	1	0	1	0	0	0	0	#		2
9	#	0	0	1	0	0	0	0	0	#		1
>= 10	#	2	5	0	1	2	0	3	1	#		14
=====												
COLUMN TOTALS	#	7	12	3	5	10	0	3	4	#		44

Pearson r = -0.038 r-squared = 0.001

GRADE: ONE STATEMENT: 7. The test items for my grade level are too difficult.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	MOST LIKELY. . . . .								LEAST LIKELY	#	ROW
		1	2	3	4	5	6	7	8			TOTALS
1	#	0	0	1	0	1	0	0	1	#		3
2	#	0	3	0	1	1	0	3	0	#		8
3	#	2	0	0	0	0	0	1	0	#		3
4	#	0	0	0	0	0	3	0	1	#		4
5	#	0	1	0	0	0	1	2	2	#		6
6	#	0	0	0	1	0	1	0	1	#		3
7	#	0	0	0	0	0	1	0	0	#		1
8	#	0	0	0	0	0	0	1	1	#		2
9	#	0	0	0	0	0	0	0	1	#		1
>= 10	#	1	1	1	3	2	1	3	2	#		14
=====												
COLUMN TOTALS	#	3	5	2	5	4	7	10	9	#		45

Pearson r = 0.106 r-squared = 0.011

GRADE: ONE STATEMENT: 6. The program objectives for my grade level are too difficult.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	MOST LIKELY. . . . .								LEAST LIKELY	#	ROW
		1	2	3	4	5	6	7	8			TOTALS
1	#	0	2	1	0	0	0	0	0	#		3
2	#	1	0	0	2	0	2	0	3	#		8
3	#	0	0	0	1	0	1	0	1	#		3
4	#	1	0	0	1	0	1	0	1	#		4
5	#	0	1	0	0	1	2	1	1	#		6
6	#	0	0	0	0	1	0	1	1	#		3
7	#	0	0	0	0	0	0	0	1	#		1
8	#	0	0	1	0	0	0	1	0	#		2
9	#	0	0	0	0	0	1	0	0	#		1
>= 10	#	0	1	1	4	2	2	1	3	#		14
=====												
COLUMN TOTALS	#	2	4	3	8	4	9	4	11	#		45

Pearson r = 0.104 r-squared = 0.011



TABLE 36

FREQUENCIES OF GRADE ONE TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: ONE      STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT.					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	1	1	0	0	0	0	#	3	
2	#	3	4	0	0	1	0	0	#	8	
3	#	1	0	1	0	1	0	0	#	3	
4	#	2	1	1	0	0	0	0	#	4	
5	#	1	2	0	2	0	0	1	#	6	
6	#	0	2	0	1	0	0	0	#	3	
7	#	1	0	0	0	0	0	0	#	1	
8	#	1	0	0	0	1	0	0	#	2	
9	#	0	1	0	0	0	0	0	#	1	
>= 10	#	2	4	3	3	2	0	0	#	14	
COLUMN TOTALS	#	12	15	6	6	5	0	1	#	45	
Pearson r = 0.199                      r-squared = 0.040											

GRADE: ONE      STATEMENT: 15. "program that is geared to the ability levels of all children."  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	0	0	1	0	0	1	#	3	
2	#	4	0	1	2	1	0	0	#	8	
3	#	1	2	0	0	0	0	0	#	3	
4	#	2	0	1	1	0	0	0	#	4	
5	#	2	1	1	0	1	1	0	#	6	
6	#	2	1	0	0	0	0	0	#	3	
7	#	1	0	0	0	0	0	0	#	1	
8	#	1	1	0	0	0	0	0	#	2	
9	#	1	0	0	0	0	0	0	#	1	
>= 10	#	4	0	1	3	3	1	2	#	14	
COLUMN TOTALS	#	19	5	4	7	5	2	3	#	45	
Pearson r = 0.178                      r-squared = 0.032											

GRADE: ONE      STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING		#	MOST IMPORTANT.							#	LEAST IMPORTANT							#	ECW														
ZONE ONE		#	1	2	3	4	5	6	7	#								#	TOTALS														
1		#	0	0	0	0	2	0	1	#								#	3														
2		#	3	0	1	0	1	3	0	#								#	8														
3		#	2	0	0	0	0	1	0	#								#	3														
4		#	1	0	0	0	1	0	2	#								#	4														
5		#	0	0	2	0	1	1	2	#								#	6														
6		#	0	0	0	1	1	1	0	#								#	3														
7		#	0	0	0	0	0	0	0	#								#	0														
8		#	0	1	0	0	0	0	1	#								#	2														
9		#	0	0	0	0	0	1	0	#								#	1														
>= 10		#	3	0	0	0	2	5	4	#								#	14														
COLUMN TOTALS		#	9	1	3	1	8	12	10	#								#	44														
Pearson r = 0.175																	r-squared = 0.031																

GRADE: ONE      STATEMENT: 16. A class room of children grouped so that their needs, abilities  
\*\*\*\*\*  
and interests are alike.

YEARS TEACHING	#	MOST IMPORTANT				LEAST IMPORTANT				#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	0	1	1	0	0	0	1	#	3	
2	#	1	2	0	1	0	0	3	#	7	
3	#	2	0	0	0	0	0	1	#	3	
4	#	0	1	1	0	1	1	0	#	4	
5	#	1	0	0	1	0	3	1	#	6	
6	#	0	1	0	0	1	0	1	#	3	
7	#	1	0	0	0	0	0	0	#	1	
8	#	0	0	0	1	0	0	1	#	2	
9	#	0	0	0	0	0	0	1	#	1	
>= 10	#	1	2	0	1	3	5	2	#	14	
=====											
COLUMN TOTALS	#	6	7	2	4	5	9	11	#	44	
=====											
Pearson r = 0.176                      r-squared = 0.031											



GRADE: ONE  
\*\*\*\*\*  
STATEMENT: 19. Number

YEARS TEACHING ZONE ONE	REASONS FOR LOW STRAND MARKS						ROW TOTALS
	A	B	C	D	E	F	
1	0	1	1	0	1	0	3
2	0	1	1	0	2	4	8
3	0	1	1	0	0	1	3
4	0	1	1	1	0	1	4
5	1	1	1	1	0	0	4
6	1	0	0	0	2	0	3
7	1	0	0	0	0	0	1
8	0	0	0	0	2	0	2
9	0	0	1	0	0	0	1
>= 10	2	2	4	0	3	0	11
COLUMN TOTALS	5	7	10	2	10	6	40

Eta-squared = 0.215

GRADE: ONE  
\*\*\*\*\*  
STATEMENT: 20. Operations and Properties

YEARS TEACHING ZONE ONE	REASONS FOR LOW STRAND MARKS						ROW TOTALS
	A	B	C	D	E	F	
1	0	0	2	0	0	0	2
2	2	1	3	0	1	1	8
3	0	2	0	0	0	0	2
4	1	0	1	0	1	1	4
5	0	2	1	1	0	0	4
6	0	0	1	0	1	0	2
7	0	0	0	1	0	0	1
8	1	0	0	1	0	0	2
9	0	0	1	0	0	0	1
>= 10	4	2	4	0	0	1	11
COLUMN TOTALS	8	7	13	3	3	3	37

Eta-squared = 0.064

GRADE: ONE  
\*\*\*\*\*  
STATEMENT: 21. Measurement

YEARS TEACHING ZONE ONE	REASONS FOR LOW STRAND MARKS						ROW TOTALS
	A	B	C	D	E	F	
1	0	0	0	0	0	1	1
2	4	1	1	0	1	1	8
3	0	0	0	0	0	2	2
4	1	0	1	0	0	2	4
5	0	1	1	0	1	1	4
6	2	0	0	1	0	0	3
7	0	0	0	1	0	0	1
8	1	0	0	0	0	1	2
9	0	0	0	0	0	0	0
>= 10	2	0	1	3	4	3	13
COLUMN TOTALS	10	2	4	5	7	11	39

Eta-squared = 0.151

GRADE: ONE  
\*\*\*\*\*  
STATEMENT: 22. Geometry

YEARS TEACHING ZONE ONE	REASONS FOR LOW STRAND MARKS						ROW TOTALS
	A	B	C	D	E	F	
1	0	1	0	0	0	0	1
2	0	1	2	0	1	0	4
3	0	0	0	1	0	0	1
4	0	1	1	1	0	0	3
5	0	0	1	1	0	0	2
6	0	0	0	1	1	1	3
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	1	0	0	0	0	0	1
>= 10	1	2	0	2	0	0	5
COLUMN TOTALS	2	5	4	6	2	1	20

Eta-squared = 0.311

GRADE: ONE  
\*\*\*\*\*  
STATEMENT: 23. Graphing

YEARS TEACHING ZONE ONE	REASONS FOR LOW STRAND MARKS						ROW TOTALS
	A	B	C	D	E	F	
1	0	0	1	0	0	0	1
2	0	1	0	1	4	2	8
3	0	1	0	0	2	0	3
4	0	0	1	1	1	1	4
5	0	1	0	2	2	0	5
6	0	2	0	0	0	0	2
7	1	0	0	0	0	0	1
8	0	0	0	0	1	1	2
9	0	0	0	0	0	0	0
>= 10	1	1	0	4	4	2	12
COLUMN TOTALS	2	6	2	8	14	6	38

Eta-squared = 0.128

TABLE 37  
FREQUENCIES OF GRADE ONE TEACHERS  
IN EXPERIENCE CATEGORIES CHOOSING  
REASONS FOR LOWEST MEANS BY STRAND



5. Textbooks do not match the program objectives.

Least likely

6. The program objectives for my grade are too difficult.

7. The test items for my grade level are too difficult.

Concerning those factors that influence the successful operation of a mathematics program in any school, grade two teachers responded with the following:

Most important

12. An instructional plan involving good teachable materials.

15. A program that is geared to the ability levels of all children.

Least important

16. A classroom of children grouped so that their needs, abilities and interests are alike.

17. The professional training of the teachers in our system.

Regarding the low achievement scores in grade two (Figure 191) teachers gave the following reasons by strand.

Number

C. Students have not mastered the previous concepts upon which this concept is dependent.

Operations and Properties

C. Students have not mastered the previous concepts upon which this concept is dependent.

Measurement



TABLE 38

FREQUENCIES OF GRADE TWO TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE NON-MASTERY PERFORMANCE

GRADE: TWO  
\*\*\*\*\*

STATEMENT: 11. Students fail to master objectives because of inadequate learning skills (e.g., forgetting).

YEARS TEACHING	#	MOST LIKELY.						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	2	0	0	0	0	0	0	0	#	2
2	#	0	1	2	2	1	0	0	0	#	6
3	#	1	1	0	0	0	1	0	0	#	3
4	#	0	2	1	0	2	1	0	0	#	6
5	#	2	0	0	1	0	0	0	0	#	3
6	#	1	1	0	2	1	0	0	1	#	6
7	#	0	0	0	0	0	0	0	0	#	0
8	#	1	0	0	0	0	0	0	0	#	1
9	#	0	1	0	0	1	0	1	0	#	3
>= 10	#	3	1	2	1	3	0	1	0	#	11
COLUMN TOTALS	#	10	7	5	6	8	2	2	1	#	41
Pearson: $r = 0.116$ $r\text{-squared} = 0.013$											

GRADE: TWO  
\*\*\*\*\*

STATEMENT: 5. Textbooks do not match the program objectives.

YEARS TEACHING	#	MOST LIKELY.						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	0	0	0	0	2	0	0	0	#	2
2	#	1	0	1	0	1	0	3	0	#	6
3	#	2	0	1	0	0	0	0	0	#	3
4	#	1	2	0	1	0	1	0	1	#	6
5	#	0	2	0	0	1	0	0	0	#	3
6	#	1	0	0	1	1	1	1	0	#	5
7	#	0	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	1	0	0	0	#	1
9	#	0	0	0	1	0	0	0	2	#	3
>= 10	#	4	3	2	0	0	2	0	0	#	11
COLUMN TOTALS	#	9	7	4	3	6	4	4	3	#	40

Pearson  $r = -0.156$        $r$ -squared = 0.024

GRADE: TWO  
\*\*\*\*\*

STATEMENT: 6. The program objectives for my grade level are too difficult.

YEARS TEACHING	#	MOST LIKELY.						LEAST LIKELY			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS	
1	#	0	0	0	0	0	0	0	2	#	2	
2	#	0	0	0	1	1	2	0	2	#	6	
3	#	0	0	0	0	0	0	1	2	#	3	
4	#	1	0	0	2	0	0	0	3	#	6	
5	#	0	0	0	0	0	0	2	1	#	3	
6	#	0	0	0	0	2	1	2	1	#	6	
7	#	0	0	0	0	0	0	0	1	#	1	
8	#	0	0	0	0	0	0	1	0	#	1	
9	#	0	0	1	0	0	0	1	1	#	3	
>= 10	#	0	1	0	1	0	3	3	3	#	11	
COLUMN TOTALS	#	1	1	1	4	3	6	10	16	#	42	

Pearson  $r = -0.086$        $r\text{-squared} = 0.007$

GRADE: TWO  
\*\*\*\*\*

STATEMENT: 7. The test items for my grade level are too difficult.

YEARS TEACHING	#	MOST LIKELY.					LEAST LIKELY			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	0	0	0	0	0	0	1	1	#	2
2	#	0	0	0	0	2	1	2	1	#	6
3	#	0	0	0	0	0	1	0	2	#	3
4	#	0	1	0	0	2	0	3	0	#	6
5	#	0	0	0	0	0	1	1	1	#	3
6	#	0	0	0	2	1	0	2	1	#	6
7	#	0	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	0	0	1	#	1
9	#	0	0	1	1	0	1	0	0	#	3
>= 10	#	0	3	0	2	0	2	4	0	#	11
COLUMN TOTALS	#	0	4	1	5	5	6	13	7	#	41

Pearson  $r = -0.367$        $r\text{-squared} = 0.149$



TABLE 39

FREQUENCIES OF GRADE TWO TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: TWO      STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT.					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	0	0	1	0	0	0	#	2	
2	#	1	0	2	1	1	1	0	#	6	
3	#	2	0	0	0	0	1	0	#	3	
4	#	3	3	0	0	0	0	0	#	6	
5	#	2	0	0	1	0	0	0	#	3	
6	#	0	2	2	0	1	0	0	#	5	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	1	0	0	0	0	0	#	1	
9	#	3	0	0	0	0	0	0	#	3	
>= 10	#	3	3	2	1	1	0	1	#	11	
COLUMN TOTALS	#	15	9	6	4	3	2	1	#	40	
Pearson r = -0.078                      r-squared = 0.005											

GRADE: TWO      STATEMENT: 15. A program that is geared to the ability levels of all children.  
\*\*\*\*\*

YEARS TEACHING		#	MOST IMPORTANT				LEAST IMPORTANT				#	ROW
ZONE ONE		#	1	2	3	4	5	6	7	#	TOTALS	
1		#	1	0	1	0	0	0	0	#	2	
2		#	0	2	3	0	0	1	0	#	6	
3		#	0	1	0	0	1	1	0	#	3	
4		#	2	1	1	2	0	0	0	#	6	
5		#	1	1	0	0	1	0	0	#	3	
6		#	4	0	0	1	1	0	0	#	6	
7		#	1	0	0	0	0	0	0	#	1	
8		#	1	0	0	0	0	0	0	#	1	
9		#	0	1	1	0	0	1	0	#	3	
>= 10		#	3	2	2	0	1	2	0	#	10	
COLUMN TOTALS		#	13	8	8	3	4	5	0	#	41	
Pearson r = -0.001                      r-squared = 0.000												

GRADE: TWO            STATEMENT: 16. A class room of children grouped so that their needs, abilities  
\*\*\*\*\*  
and interests are alike.

YEARS TEACHING	#	MOST IMPORTANT.					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	0	0	0	0	0	1	#	2	
2	#	1	0	0	1	1	1	2	#	6	
3	#	0	0	0	1	0	0	1	#	2	
4	#	0	0	1	1	2	2	0	#	6	
5	#	0	0	0	1	1	0	1	#	3	
6	#	0	0	1	1	0	4	0	#	6	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	0	0	0	1	0	#	1	
9	#	0	1	0	0	1	0	1	#	3	
>= 10	#	1	1	3	1	0	2	3	#	11	
COLUMN TOTALS	#	3	2	5	6	5	10	9	#	40	
Pearson r = -0.073                      r-squared = 0.005											

GRADE: TWO      STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	2	0	0	0	0	0	0	#	2	
2	#	1	0	1	0	1	2	1	#	6	
3	#	0	2	0	0	0	1	0	#	3	
4	#	0	0	0	2	1	0	3	#	6	
5	#	0	0	0	0	0	3	0	#	3	
6	#	0	1	1	3	0	0	1	#	6	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	0	0	1	0	0	#	1	
9	#	0	1	0	2	0	0	0	#	3	
>= 10	#	1	1	1	0	1	2	5	#	11	
COLUMN TOTALS	#	4	5	3	7	4	8	10	#	41	

Pearson  $r = 0.182$        $r$ -squared = 0.033



GRADE: TWO STATEMENT: 19. Number

YEARS TEACHING		REASONS FOR LOW STRAND MARKS						ROW TOTALS	
ZONE ONE		A	B	C	D	E	F		
1	1	0	1	1	0	0	0	2	
2	2	1	0	2	0	1	1	5	
3	3	1	0	1	0	0	0	2	
4	4	0	1	3	0	1	1	6	
5	5	1	0	2	0	0	0	3	
6	6	1	1	2	1	0	1	6	
7	7	1	0	0	0	0	0	1	
8	8	0	0	0	0	1	0	1	
9	9	1	0	1	0	0	1	3	
>= 10		4	0	5	0	2	0	11	
COLUMN TOTALS		10	3	17	1	5	4	40	

Eta-squared = 0.093

GRADE: TWO STATEMENT: 22. Geometry

YEARS TEACHING		REASONS FOR LOW STRAND MARKS						ROW TOTALS	
ZONE ONE		A	B	C	D	E	F		
1	1	0	1	1	0	0	0	2	
2	2	0	0	1	1	2	1	5	
3	3	0	1	1	0	1	0	3	
4	4	0	0	1	3	1	0	5	
5	5	0	0	0	0	2	0	2	
6	6	0	0	1	1	3	1	6	
7	7	0	0	0	1	0	0	1	
8	8	0	0	0	0	1	0	1	
9	9	0	0	1	1	1	0	3	
>= 10		1	2	2	1	5	0	11	
COLUMN TOTALS		1	4	8	8	16	2	39	

Eta-squared = 0.081

GRADE: TWO STATEMENT: 20. Operations and Properties

YEARS TEACHING		REASONS FOR LOW STRAND MARKS						ROW TOTALS	
ZONE ONE		A	B	C	D	E	F		
1	1	0	0	1	0	0	0	1	
2	2	1	0	1	0	2	1	5	
3	3	0	0	2	1	0	0	3	
4	4	2	1	2	0	1	0	6	
5	5	1	0	1	0	0	0	2	
6	6	1	0	1	1	1	2	6	
7	7	1	0	0	0	0	0	1	
8	8	0	0	1	0	0	0	1	
9	9	0	0	1	0	2	0	3	
>= 10		3	0	4	1	3	0	11	
COLUMN TOTALS		9	1	14	3	9	3	39	

Eta-squared = 0.047

GRADE: TWO STATEMENT: 21. Measurement

YEARS TEACHING		REASONS FOR LOW STRAND MARKS						ROW TOTALS	
ZONE ONE		A	B	C	D	E	F		
1	1	0	1	0	0	1	0	2	
2	2	0	0	0	0	4	1	5	
3	3	0	0	1	2	0	0	3	
4	4	1	3	1	0	0	0	6	
5	5	1	0	1	0	1	1	2	
6	6	0	3	0	1	1	1	6	
7	7	0	1	0	0	0	0	1	
8	8	0	0	1	0	0	0	1	
9	9	0	2	0	1	0	0	3	
>= 10		1	1	1	1	7	0	11	
COLUMN TOTALS		3	11	5	5	13	3	40	

Eta-squared = 0.041

TABLE 40  
FREQUENCIES OF GRADE TWO TEACHERS  
IN EXPERIENCE CATEGORIES CHOOSING  
REASONS FOR LOWEST MEANS BY STRAND



E. This topic would not receive the instructional emphasis required for mastery.

### Geometry

E. This topic would not receive the instructional emphasis required for mastery.

### Graphing

E. This topic would not receive the instructional emphasis required for mastery.

## Grade Three

Grade three teachers cited the following as the most and least likely influences for children within their schools not reaching the 85-100 percent achievement category:

### Most likely

5. Textbooks do not match the program objectives.
11. Students fail to master objectives because of inadequate learning skills.

### Least likely

9. The sequencing of content in our textbook is inappropriate.
10. Keeping track of failure and successes and subsequent follow-up is too difficult.

With regard to the most likely it appears as though teachers with more than five years of experience in the zone were more likely to choose the textbook mismatch as the most likely factor while the teachers with less experience



avored the inadequate learning skills factor.

With regard to the contributing factors to a good mathematics program, grade three teachers chose the following:

Most important

15. A program that is geared to the ability levels of all children.
12. An instructional plan involving good teachable materials.

Least important

17. The professional training of teachers in our system.
18. The continuous (inservice) education of teachers in our system in mathematics.

The influences which these teachers considered to be most responsible for the low achievement scores in the grade three strands were as follows:

Number

- C. Students have not mastered previous concepts upon which this concept is dependent.

Operations and Properties

- C. Students have not mastered previous concepts upon which this concept is dependent.

Measurement

- E. This topic would not receive the instructional emphasis required for mastery.

Geometry

- E. The topic would not receive the instructional







TABLE 42

# FREQUENCIES OF GRADE THREE TEACHERS IN EXPERIENCE CATEGORIES CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: THREE STATEMENT: 15. A program that is geared to the ability levels of all children.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	1	2	3	4	5	6	7	#	ROW TOTALS
1	#	2	3	3	0	0	0	0	#	8
2	#	2	2	0	2	1	0	0	#	7
3	#	1	1	1	1	1	0	0	#	5
4	#	0	0	0	0	0	1	0	#	1
5	#	1	1	0	0	0	0	0	#	2
6	#	1	1	0	0	1	1	0	#	4
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	1	0	#	1
9	#	1	0	1	0	2	0	0	#	4
>= 10	#	5	0	3	3	1	2	0	#	14
COLUMN TOTALS	#	13	8	8	6	6	5	0	#	46

Pearson r = 0.192 r-squared = 0.037

GRADE: THREE STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	1	2	3	4	5	6	7	#	ROW TOTALS
1	#	1	1	1	3	1	1	0	#	8
2	#	2	0	4	1	0	0	0	#	7
3	#	0	3	1	0	1	0	0	#	5
4	#	1	0	0	0	0	0	0	#	1
5	#	1	0	1	0	0	0	0	#	2
6	#	0	2	2	0	0	0	0	#	4
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	1	0	0	0	0	#	1
9	#	0	1	0	3	0	0	0	#	4
>= 10	#	3	5	2	1	0	0	3	#	14
COLUMN TOTALS	#	8	12	12	8	2	1	3	#	46

Pearson r = 0.036 r-squared = 0.001

GRADE: THREE STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	1	2	3	4	5	6	7	#	ROW TOTALS
1	#	1	0	1	3	0	2	1	#	8
2	#	1	0	0	0	1	4	1	#	7
3	#	1	0	0	2	1	0	0	#	4
4	#	0	0	0	0	0	0	1	#	1
5	#	0	1	0	0	0	1	0	#	2
6	#	0	0	0	0	0	1	3	#	4
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	0	1	#	1
9	#	1	0	1	1	0	0	1	#	4
>= 10	#	1	0	3	1	2	2	4	#	13
COLUMN TOTALS	#	5	1	5	7	4	10	12	#	44

Pearson r = 0.048 r-squared = 0.002

GRADE: THREE STATEMENT: 18. The continuous (inservice) education of teachers in our system  
in mathematics.  
\*\*\*\*\*

YEARS TEACHING # ZONE ONE	#	1	2	3	4	5	6	7	#	ROW TOTALS
1	#	2	1	0	0	0	4	1	#	8
2	#	0	1	1	0	1	2	2	#	7
3	#	0	0	2	1	0	1	1	#	5
4	#	1	0	0	0	0	0	0	#	1
5	#	0	0	0	0	1	0	1	#	2
6	#	0	0	0	2	0	2	0	#	4
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	1	0	0	#	1
9	#	0	1	0	1	0	1	1	#	4
>= 10	#	1	3	1	1	2	4	2	#	14
COLUMN TOTALS	#	4	6	4	5	5	14	8	#	46

Pearson r = -0.025 r-squared = 0.001



GRADE: THREE STATEMENT: 19. Number

YEARS TEACHING		REASONS FOR LOW STRAND MARKS					ROW TOTALS	
ZONE ONE		A	B	C	D	E	F	
1	6	0	0	3	2	1	0	6
2	7	1	0	6	0	0	0	7
3	4	0	0	4	0	0	0	4
4	1	0	0	1	0	0	0	1
5	2	0	0	1	0	0	1	2
6	0	1	0	0	0	1	0	2
7	0	0	0	0	0	0	0	0
8	1	0	0	0	0	1	0	1
9	4	2	1	1	0	0	0	4
>= 10		1	0	9	1	0	2	13
COLUMN TOTALS		5	1	25	3	3	3	40

Eta-squared = 0.100

GRADE: THREE STATEMENT: 20. Operations and Properties

YEARS TEACHING		REASONS FOR LOW STRAND MARKS					ROW TOTALS	
ZONE ONE		A	B	C	D	E	F	
1	7	1	0	4	1	1	0	7
2	7	3	1	2	1	0	0	7
3	4	0	1	3	0	0	0	4
4	1	0	1	0	0	0	0	1
5	2	1	0	1	0	0	0	2
6	0	0	0	1	0	1	0	2
7	0	0	0	0	0	0	0	0
8	1	0	0	0	1	0	0	1
9	4	2	0	2	0	0	0	4
>= 10		2	0	5	2	5	0	14
COLUMN TOTALS		9	3	18	5	7	0	42

Eta-squared = 0.114

GRADE: THREE STATEMENT: 21. Measurement

YEARS TEACHING		REASONS FOR LOW STRAND MARKS					ROW TOTALS	
ZONE ONE		A	B	C	D	E	F	
1	5	1	1	1	1	0	1	5
2	7	1	0	1	3	2	0	7
3	5	0	1	2	0	2	0	5
4	1	0	0	0	0	1	0	1
5	3	0	0	0	0	1	0	3
6	0	0	1	0	0	0	0	0
7	1	0	0	0	0	0	0	1
8	4	0	0	1	1	1	0	4
9	14	0	2	0	1	3	5	14
>= 10		2	2	1	1	3	5	14
COLUMN TOTALS		4	8	5	6	11	7	41

Eta-squared = 0.148

GRADE: THREE STATEMENT: 22. Geometry

YEARS TEACHING		REASONS FOR LOW STRAND MARKS					ROW TOTALS	
ZONE ONE		A	B	C	D	E	F	
1	6	0	1	0	0	4	1	6
2	7	0	2	0	0	5	0	7
3	4	0	1	1	0	2	0	4
4	1	0	0	0	0	1	0	1
5	2	0	0	1	0	1	0	2
6	0	0	1	0	2	1	0	4
7	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	1	1
9	4	0	0	1	1	2	0	4
>= 10		0	4	2	1	5	2	14
COLUMN TOTALS		0	9	5	4	21	4	43

Eta-squared = 0.094

GRADE: THREE STATEMENT: 23. Graphing

YEARS TEACHING		REASONS FOR LOW STRAND MARKS					ROW TOTALS	
ZONE ONE		A	B	C	D	E	F	
1	6	0	0	0	3	3	0	6
2	7	0	0	0	2	5	0	7
3	4	1	1	0	0	1	0	3
4	1	0	1	0	0	0	0	1
5	2	0	0	1	0	1	0	2
6	0	0	0	0	0	3	0	3
7	0	0	0	0	0	0	0	0
8	1	0	0	0	1	0	0	1
9	4	0	1	0	3	0	0	4
>= 10		0	3	1	3	4	2	13
COLUMN TOTALS		1	6	2	12	17	2	40

Eta-squared = 0.171

TABLE 43  
FREQUENCIES OF GRADE THREE TEACHERS  
IN EXPERIENCE CATEGORIES CHOOSING  
REASONS FOR LOWEST MEANS BY STRAND



emphasis required for mastery.

### Graphing

E. This topic would not receive the instructional emphasis required for mastery.

### Grade Four

Grade four teachers gave the following factors as the most and the least likely causes for students within their school system not achieving to the 85-100 percent level.

#### Most likely

8. The varied ability of my students makes instruction difficult.
11. Students fail to master objectives because of inadequate learning skills (eg. forgetting).

#### Least likely

10. Keeping track of failures and successes and subsequent follow-up is too difficult.
6. The program objectives for my grade are too difficult.

The teachers with the least experience frequently chose the varied abilities factor as the most likely contributor while the more experienced teachers favored the inadequate learning skills aspect.

When considering those aspects which are important to the operation of a good mathematics program, grade four teachers chose the following:

#### Most important



12. An instructional plan involving good teaching materials.

13. Textbooks that students like and which cover the program objectives.

#### Least important

16. A classroom of children grouped so that their needs, abilities and interests are alike.

17. The professional training of teachers in our system.

The grade four instructional people responded to these factors as the main cause for the low scores in the strands (Figure 191).

#### Number

C. Student have not mastered previous concepts upon which this concept is dependent.

F. This concept is beyond the ability of children at this particular grade level.

#### Operations and Properties

C. Students have not mastered previous concepts upon which this concept is dependent.

E. This topic would not receive the instructional emphasis required for mastery.

#### Measurement

E. This topic would not receive the instructional emphasis required for mastery.

#### Geometry

E. This topic would not receive the instructional emphasis required for mastery.



TABLE 44

# FREQUENCIES OF GRADE FOUR TEACHERS IN EXPERIENCE CATEGORIES CHOOSING FACTORS THAT INFLUENCE NON-MASTERY PERFORMANCE

GRADE: FOUR STATEMENT: 8. The varied abilities of my students makes instruction difficult  
\*\*\*\*\*

YEARS TEACHING #	MOST LIKELY . . . . .								LEAST LIKELY #	ROW
ZONE ONE #	1	2	3	4	5	6	7	8	#	TOTALS
1	3	2	1	0	0	2	1	2	6	11
2	3	0	0	1	0	0	0	0	4	4
3	2	1	0	0	0	0	0	0	3	3
4	1	1	0	0	1	0	0	0	3	3
5	3	2	0	0	1	0	1	0	7	7
6	1	0	2	0	0	1	0	0	4	4
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	1	0	0	0	1	1
9	0	0	0	1	1	1	0	0	3	3
>= 10	2	2	1	1	1	2	1	2	12	12
COLUMN TOTALS	15	8	4	3	5	6	3	4	48	

Pearson r = 0.214 r-squared = 0.046

GRADE: FOUR STATEMENT: 11. Students fail to master objectives because of inadequate learning skills (e.g., forgetting).  
\*\*\*\*\*

YEARS TEACHING #	MOST LIKELY . . . . .								LEAST LIKELY #	ROW
ZONE ONE #	1	2	3	4	5	6	7	8	#	TOTALS
1	1	2	2	3	1	0	0	1	10	10
2	1	1	0	2	0	0	0	0	4	4
3	1	2	0	0	0	0	0	0	3	3
4	1	0	1	1	0	0	0	0	3	3
5	1	2	1	0	0	0	3	0	7	7
6	1	1	1	0	0	0	0	1	4	4
7	0	0	0	0	0	0	0	0	0	0
8	0	1	0	0	0	0	0	0	1	1
9	1	0	1	1	0	0	0	0	3	3
>= 10	2	2	3	2	2	0	1	0	12	12
COLUMN TOTALS	9	11	9	9	3	0	4	2	47	

Pearson r = -0.005 r-squared = 0.000

GRADE: FOUR STATEMENT: 10. Keeping track of failure and successes and subsequent follow-up is too difficult.  
\*\*\*\*\*

YEARS TEACHING #	MOST LIKELY . . . . .								LEAST LIKELY #	ROW
ZONE ONE #	1	2	3	4	5	6	7	8	#	TOTALS
1	1	1	0	2	1	3	1	2	11	11
2	1	1	0	0	0	0	0	2	4	4
3	0	1	0	0	0	0	0	0	1	1
4	1	0	0	0	1	0	1	0	3	3
5	0	2	1	2	0	1	0	1	7	7
6	0	0	1	1	1	0	0	1	4	4
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	1	0	1	1
9	0	1	0	0	0	0	0	2	3	3
>= 10	1	0	1	0	0	2	4	4	12	12
COLUMN TOTALS	4	6	3	5	3	6	7	14	48	

Pearson r = 0.205 r-squared = 0.042

GRADE: FOUR STATEMENT: 6. The program objectives for my grade level are too difficult.  
\*\*\*\*\*

YEARS TEACHING #	MOST LIKELY . . . . .								LEAST LIKELY #	ROW
ZONE ONE #	1	2	3	4	5	6	7	8	#	TOTALS
1	0	0	1	1	1	0	4	3	10	10
2	0	0	0	1	0	1	2	0	4	4
3	0	0	1	0	1	0	1	0	3	3
4	0	2	0	0	0	0	1	0	3	3
5	0	0	1	3	1	0	2	0	7	7
6	0	0	0	1	0	0	2	0	3	3
7	0	0	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	1	0	2	2
9	1	0	0	0	0	1	1	0	3	3
>= 10	2	1	3	0	2	0	0	4	12	12
COLUMN TOTALS	4	3	6	6	5	2	13	7	46	

Pearson r = -0.285 r-squared = 0.081



TABLE 45

FREQUENCIES OF GRADE FOUR TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: FOUR      STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TFACHING	#	MOST IMPORTANT.				LEAST IMPORTANT				#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	7	2	2	0	0	0	0	#	11	
2	#	3	0	0	0	1	0	0	#	4	
3	#	1	1	1	0	0	0	0	#	3	
4	#	0	1	0	1	0	0	0	#	2	
5	#	1	0	3	2	0	0	1	#	7	
6	#	2	0	1	0	0	1	0	#	4	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	1	0	0	0	0	0	#	1	
9	#	1	1	1	0	0	0	0	#	3	
>= 10	#	2	4	1	2	1	0	2	#	12	
COLUMN TOTALS	#	17	10	9	5	2	1	3	#	47	
Pearson r = 0.324                      r-squared = 0.105											

GRADE: FOUR      STATEMENT: 13. Textbooks that students like and which cover the program  
\*\*\*\*\* objectives.

YEARS TEACHING	#	MOST IMPORTANT.				LEAST IMPORTANT				#	RCW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	4	4	1	1	0	0	0	#	10	
2	#	2	1	0	1	0	0	0	#	4	
3	#	1	1	0	1	0	0	0	#	3	
4	#	1	1	0	0	0	0	0	#	2	
5	#	3	0	0	1	2	0	1	#	7	
6	#	0	1	1	0	1	0	1	#	4	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	1	0	0	0	0	#	1	
9	#	0	2	1	0	0	0	0	#	3	
>= 10	#	4	1	2	3	0	1	1	#	12	
COLUMN TOTALS	#	15	11	6	7	3	1	3	#	46	
Pearson r = 0.248                      r-squared = 0.061											

GRADE: FOUR      STATEMENT: 16. A class room of children grouped so that their needs, abilities, and interests are alike.

YEARS TEACHING	#	MOST IMPORTANT.					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	2	0	0	1	2	3	3	#	11	
2	#	2	0	0	0	1	1	0	#	4	
3	#	0	1	0	0	0	1	1	#	3	
4	#	0	0	0	1	0	0	2	#	3	
5	#	2	1	0	1	1	1	1	#	7	
6	#	1	1	0	0	0	0	2	#	4	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	0	0	0	0	1	#	1	
9	#	0	0	0	1	1	0	1	#	3	
>= 10	#	0	0	2	3	2	3	2	#	12	
COLUMN TOTALS	#	7	3	2	7	7	9	13	#	48	
Pearson r = 0.082                      r-squared = 0.007											

GRADE: FOUR      STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT				LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	2	0	0	2	2	3	2	#	11
2	#	1	0	0	0	0	1	2	#	4
3	#	0	1	0	0	0	2	0	#	3
4	#	0	0	0	1	2	0	0	#	3
5	#	0	1	0	0	2	1	3	#	7
6	#	0	0	0	0	2	2	0	#	4
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	1	0	0	#	1
9	#	0	0	0	0	2	1	0	#	3
>= 10	#	2	2	2	0	2	1	5	#	12
COLUMN TOTALS	#	5	4	2	3	13	11	10	#	48

Pearson  $r = -0.108$        $r\text{-squared} = 0.012$



GRADE: FOUR STATEMENT: 19. Number

GRADE: FOUR STATEMENT: 22. Geometry

YEARS TEACHING	REASONS FOR LOW STRAND MARKS					POW TOTALS
ZONE ONE	A	B	C	D	E	F
1	0	4	5	0	1	0
2	0	0	0	0	1	0
3	0	0	1	0	1	0
4	0	0	1	0	1	1
5	1	1	2	0	1	2
6	0	0	1	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	1
9	1	0	0	1	1	0
>= 10	0	2	1	0	1	5
COLUMN TOTALS	2	7	11	1	7	11
Eta-squared = 0.198						
POW TOTALS						39

GRADE: FOUR STATEMENT: 20. Operations and Properties

GRADE: FOUR STATEMENT: 23. Graphing

YEARS TEACHING	REASONS FOR LOW STRAND MARKS					POW TOTALS
ZONE ONE	A	B	C	D	E	F
1	1	2	3	0	3	1
2	0	1	2	0	0	0
3	0	0	2	0	1	0
4	1	0	2	0	0	0
5	2	0	4	0	1	0
6	0	0	1	0	1	0
7	0	0	0	0	0	0
8	0	0	1	0	0	0
9	0	0	0	0	2	0
>= 10	3	2	2	0	2	1
COLUMN TOTALS	7	5	17	0	10	2
Eta-squared = 0.046						
POW TOTALS						41

GRADE: FOUR STATEMENT: 21. Measurement

Eta-squared = 0.168

YEARS TEACHING	REASONS FOR LOW STRAND MARKS					POW TOTALS
ZONE ONE	A	B	C	D	E	F
1	0	2	3	3	1	1
2	0	0	0	1	1	1
3	1	0	1	0	0	0
4	0	0	2	0	1	0
5	0	2	1	1	3	0
6	0	0	0	1	1	0
7	0	0	0	0	0	0
8	0	1	0	0	0	0
9	0	0	0	1	1	0
>= 10	1	3	1	1	1	2
COLUMN TOTALS	2	8	8	8	9	4
Eta-squared = 0.081						
POW TOTALS						29

TABLE 46  
FREQUENCIES OF GRADE FOUR TEACHERS  
IN EXPERIENCE CATEGORIES CHOOSING  
REASONS FOR LOWEST MEANS BY STRAND



Graphing

E. This topic would not receive the instructional emphasis required for mastery.

Grade Five

The factors below were chosen by grade five teachers as representing the most likely and least likely influences for pupils not achieving within Category D (85-100 percent).

Most likely

- 5. Textbooks do not match the program objectives.
- 11. Students fail to master objectives because of inadequate learning skills (eg. forgetting).

Least likely

- 6. The program objectives for my grade level are too difficult.
- 10. Keeping track of failures and successes and subsequent follow-up is too difficult.

When thinking about the quality aspect of a mathematics program they suggest the points which follow:

Most important

- 12. An instructional plan involving good teachable materials.
- 15. A program geared to the ability levels of all children.

Least important

- 17. The professional training of teachers in our system.
- 18. The continuous (inservice) education of teachers in



our system in mathematics.

The difficulties within the strands at the grade five level were attributed to the factors listed below.

#### Number

- C. Students have not mastered previous concepts upon which this concept is dependent.

#### Operations and Properties

- A. Students traditionally have difficulty with this topic.

#### Measurement

- B. The topic is new. Understanding will grow with teacher familiarity.

#### Geometry

- E. This topic would not receive the instructional emphasis required for mastery.

#### Graphing

- E. This topic would not receive the instructional emphasis required for msatery.

### Grade Six

According to the grade six teachers the most and least likely factors that caused the lack of achievement to the 85-100 percent level in their schools are:

#### Most likely

11. Students fail to master objectives because of inadequate learning skills (eg. forgetting).
5. Textbooks do not match the program objectives



YEARS TEACHING	#	MOST LIKELY						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	0	0	0	0	0	1	1	1	#	3
2	#	0	0	1	0	0	0	1	0	#	2
3	#	1	0	0	1	0	1	0	1	#	4
4	#	0	0	0	0	0	1	2	1	#	4
5	#	0	0	0	0	1	0	0	1	#	2
6	#	0	0	0	0	0	0	0	1	#	1
7	#	0	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	0	0	0	#	0
9	#	0	0	0	0	0	0	0	0	#	0
>= 10	#	0	0	0	2	2	2	0	2	#	8
COLUMN TOTALS	#	1	0	1	3	3	5	4	7	#	24

Pearson  $r = -0.056$        $r$ -squared = 0.003



TABLE 48

FREQUENCIES OF GRADE FIVE TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: FIVE      STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT				LEAST IMPORTANT				#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	0	1	3	0	0	0	#	5	
2	#	0	0	1	1	0	0	0	#	2	
3	#	3	0	0	1	0	0	0	#	4	
4	#	0	2	0	2	0	0	0	#	4	
5	#	1	0	1	0	0	0	0	#	2	
6	#	0	0	1	0	0	0	0	#	1	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	0	0	0	0	0	#	0	
9	#	0	0	0	0	0	0	0	#	0	
>= 10	#	4	2	0	2	0	0	1	#	9	
=====											
COLUMN TOTALS	#	9	4	4	9	0	0	1	#	27	
=====											
Pearson r = -0.098                      r-squared = 0.010											

GRADE: FIVE      STATEMENT: 15. A program that is geared to the ability levels of all children.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT.							#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	4	0	0	0	0	1	0	#	5
2	#	0	2	0	0	0	0	0	#	2
3	#	0	0	0	0	1	1	2	#	4
4	#	3	0	1	0	0	0	0	#	4
5	#	1	0	0	0	0	1	0	#	2
6	#	0	1	0	0	0	0	0	#	1
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	0	0	#	0
9	#	0	0	0	0	0	0	0	#	0
>= 10	#	2	0	1	2	2	1	1	#	9
COLUMN TOTALS	#	10	3	2	2	3	4	3	#	27

Pearson  $r = 0.218$        $r\text{-squared} = 0.048$

GRADE: FIVE      STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT					LEAST IMPORTANT			#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS	
1	#	1	0	1	1	0	0	2	#	5	
2	#	0	0	0	0	1	0	1	#	2	
3	#	0	1	0	0	1	0	2	#	4	
4	#	0	0	0	0	0	2	2	#	4	
5	#	0	0	0	1	1	0	0	#	2	
6	#	0	0	0	0	0	0	1	#	1	
7	#	0	0	0	0	0	0	0	#	0	
8	#	0	0	0	0	0	0	0	#	0	
9	#	0	0	0	0	0	0	0	#	0	
>= 10	#	0	0	1	1	2	2	3	#	9	
=====											
COLUMN TOTALS	#	1	1	2	3	5	4	11	#	27	
Pearson r = 0.131                      r-squared = 0.017											

GRADE: FIVE      STATEMENT: 18. The continuous (inservice) education of teachers in our system  
\*\*\*\*\*  
in mathematics.

YEARS TEACHING	#	MOST IMPORTANT..				LEAST IMPORTANT			#	ROW
ZONE ONF	#	1	2	3	4	5	6	7	#	TOTALS
1	#	1	2	0	0	1	1	0	#	5
2	#	0	0	0	0	1	1	0	#	2
3	#	0	1	1	1	0	0	1	#	4
4	#	0	0	0	1	1	1	1	#	4
5	#	0	0	1	0	0	1	0	#	2
6	#	0	0	0	0	0	1	0	#	1
7	#	0	0	0	0	0	0	0	#	0
8	#	0	0	0	0	0	0	0	#	0
9	#	0	0	0	0	0	0	0	#	0
>= 10	#	1	0	1	0	1	5	1	#	9
COLUMN TOTALS	#	2	3	3	2	4	10	3	#	27

Pearson r = 0.269      r-squared = 0.072



GRADE: FIVE									
STATEMENT: 19. Number									
*****									
GRADE: FIVE									
*****									
STATEMENT: 22. Geometry									
*****									
GRADE: FIVE									
*****									
STATEMENT: 23. Graphing									
*****									
Eta-squared = 0.232									
*****									
Eta-squared = 0.120									
*****									
Eta-squared = 0.126									
*****									
Eta-squared = 0.038									
*****									

GRADE: FIVE									
*****									
STATEMENT: 21. Measurement									
*****									
Eta-squared = 0.126									
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Eta-squared = 0.126									
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Least likely

10. Keeping track of failures and successes and subsequent follow-up is too difficult.

6. The program objectives for my grade level are too difficult.

The grade six teachers thought the following to be the factors of most and least importance in the conducting of a good mathematics program:

Most important

12. An instructional plan involving teachable materials.

15. A program that is geared to the ability levels of all children.

Least important

17. The professional training of teachers in our systems.

16. A classroom of children grouped so that their needs, abilities and interests are alike.

The grade six teachers regarded the following influence to be the primary cause of the low achievement scores within each of the strands.

Number

C. Students have not mastered previous concepts upon which this concept is dependent.

Operations and Properties

C. Students have not mastered previous concepts upon which this concept is dependent.

Measurement



TABLE 50

FREQUENCY OF GRADE SIX TEACHERS IN EXPERIENCE CATEGORIES  
CHOOSING FACTORS THAT INFLUENCE NON-MASTERY PERFORMANCE

GRADE: SIX  
\*\*\*\*\*

STATEMENT: 11. Students fail to master objectives because of inadequate learning skills (e.g., forgetting).

YEARS TEACHING	#	MOST LIKELY.						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	2	0	0	1	1	0	0	1	#	5
2	#	3	0	1	1	0	0	0	0	#	5
3	#	1	2	0	0	0	0	0	0	#	3
4	#	0	1	0	1	0	0	0	0	#	2
5	#	1	0	0	0	1	1	0	0	#	3
6	#	0	0	0	0	0	0	0	0	#	0
7	#	1	0	0	0	0	0	0	0	#	1
8	#	0	0	1	1	0	0	0	0	#	2
9	#	0	1	1	0	0	0	0	0	#	2
>= 10	#	3	2	1	4	1	0	0	0	#	11
COLUMN TOTALS	#	11	6	4	8	3	1	0	1	#	34

Pearson  $r = -0.014$        $r$ -squared = 0.000

GRADE: SIX  
\*\*\*\*\*

STATEMENT: 5. Textbooks do not match the program objectives.

YEARS TEACHING	#	MOST LIKELY						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	0	2	1	2	0	0	0	0	#	5
2	#	1	1	1	1	0	0	1	0	#	5
3	#	0	0	1	0	1	0	0	1	#	3
4	#	1	0	0	1	0	0	0	0	#	2
5	#	1	1	0	0	0	0	1	0	#	3
6	#	0	0	0	0	0	0	0	0	#	0
7	#	0	0	0	0	0	0	1	0	#	1
8	#	1	1	0	0	0	0	0	0	#	2
9	#	0	1	0	0	0	0	0	1	#	2
>= 10	#	3	3	0	3	0	3	0	0	#	12
COLUMN TOTALS	#	7	9	3	7	1	3	3	2	#	35

Pearson  $r = -0.018$        $r$ -squared = 0.000

GRADE: SIX  
\*\*\*\*\*

STATEMENT: 10. Keeping track of failure and successes and subsequent follow-up is too difficult.

YEARS TEACHING	#	MCST LIKELY.										LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS				
1	#	0	0	0	0	2	0	3	0	#	5				
2	#	0	0	1	0	1	0	0	3	#	5				
3	#	0	0	1	0	1	0	1	0	#	3				
4	#	0	0	0	0	0	1	0	1	#	2				
5	#	0	0	0	0	0	1	0	2	#	3				
6	#	0	0	0	0	0	0	0	0	#	0				
7	#	0	1	0	0	0	0	0	0	#	1				
8	#	0	0	0	0	0	1	1	0	#	2				
9	#	0	0	0	0	1	1	0	0	#	2				
>= 10	#	0	1	0	0	3	3	2	3	#	12				
=====															
COLUMN TOTALS	#	0	2	2	0	8	7	7	9	#	35				
Pearson r = -0.059                      r-squared = 0.004															

GRADE: SIX  
\*\*\*\*\*

STATEMENT: 6. The program objectives for my grade level are too difficult.

YEARS TEACHING	#	MOST LIKELY						LEAST LIKELY		#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	8	#	TOTALS
1	#	0	0	0	1	1	0	2	1	#	5
2	#	0	0	1	1	1	1	1	0	#	5
3	#	0	0	1	0	0	1	0	1	#	3
4	#	0	0	0	0	0	0	0	2	#	2
5	#	0	0	0	1	0	1	1	0	#	3
6	#	0	0	0	0	0	0	0	0	#	0
7	#	0	0	0	0	0	1	0	0	#	1
8	#	0	0	0	0	0	1	1	0	#	2
9	#	0	0	1	0	0	0	0	1	#	2
>= 10	#	0	1	1	0	2	2	5	1	#	12
COLUMN TOTALS	#	0	1	4	3	4	7	10	6	#	35

Pearson r = 0.008      r-squared = 0.000



TABLE 51

# FREQUENCIES OF GRADE SIX TEACHERS IN EXPERIENCE CATEGORIES CHOOSING FACTORS THAT INFLUENCE GOOD MATHEMATICS PROGRAMS

GRADE: SIX      STATEMENT: 12. A instructional plan involving good teachable materials.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT. . . . . LEAST IMPORTANT							#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	4	0	0	0	1	0	0	#	5
2	#	4	0	0	1	0	0	0	#	5
3	#	0	0	0	2	1	0	0	#	3
4	#	0	0	1	0	0	1	0	#	2
5	#	1	0	0	1	1	0	0	#	3
6	#	0	0	0	0	0	0	0	#	0
7	#	0	0	0	0	1	0	0	#	1
8	#	0	1	0	0	0	0	0	#	1
9	#	1	1	0	0	0	0	0	#	2
>= 10	#	5	1	1	4	0	1	0	#	12
=====										
COLUMN TOTALS	#	15	3	2	8	4	2	0	#	34

Pearson r = 0.059      r-squared = 0.003

GRADE: SIX      STATEMENT: 15. A program that is geared to the ability levels of all children.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT. . . . . LEAST IMPCRTANT							#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	0	1	2	0	0	1	1	#	5
2	#	0	3	1	1	0	0	0	#	5
3	#	1	1	0	0	0	0	1	#	3
4	#	0	1	0	1	0	0	0	#	2
5	#	1	2	0	0	0	0	0	#	3
6	#	0	0	0	0	0	0	0	#	0
7	#	1	0	0	0	0	0	0	#	1
8	#	0	0	0	2	0	0	0	#	2
9	#	0	0	1	0	1	0	0	#	2
>= 10	#	2	2	2	1	1	3	0	#	11
=====										
COLUMN TOTALS	#	5	10	6	5	2	4	2	#	34

Pearson r = 0.057      r-squared = 0.003

GRADE: SIX      STATEMENT: 17. The professional training of the teacher in our system.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT. . . . . LEAST IMPORTANT							#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	1	0	0	2	1	1	0	#	5
2	#	1	0	0	0	2	0	2	#	5
3	#	0	0	1	0	1	1	0	#	3
4	#	1	0	0	0	0	0	1	#	2
5	#	0	0	0	0	0	1	2	#	3
6	#	0	0	0	0	0	0	0	#	0
7	#	0	0	0	0	0	0	1	#	1
8	#	0	0	0	1	0	0	1	#	2
9	#	0	0	0	1	0	0	1	#	2
>= 10	#	1	2	2	0	3	3	1	#	12
=====										
COLUMN TOTALS	#	4	2	3	4	7	6	9	#	35

Pearson r = -0.010      r-squared = 0.000

GRADE: SIX      STATEMENT: 16. A class room of children grouped so that their needs, abilities  
and interests are alike.  
\*\*\*\*\*

YEARS TEACHING	#	MOST IMPORTANT. . . . . LEAST IMPORTANT							#	ROW
ZONE ONE	#	1	2	3	4	5	6	7	#	TOTALS
1	#	0	0	0	0	1	2	2	#	5
2	#	0	0	0	1	1	2	1	#	5
3	#	2	1	0	0	0	0	0	#	3
4	#	1	0	0	0	0	0	1	#	2
5	#	0	0	1	1	0	0	1	#	3
6	#	0	0	0	0	0	0	0	#	0
7	#	0	0	0	1	0	0	0	#	1
8	#	0	0	0	1	0	1	0	#	2
9	#	0	0	0	1	0	1	0	#	2
>= 10	#	0	1	1	2	4	0	4	#	12
=====										
COLUMN TOTALS	#	3	2	2	7	6	6	9	#	35

Pearson r = -0.005      r-squared = 0.000



GRADE: SIX STATEMENT: 19. Number

YEARS TEACHING	#	REASONS FOR LOW STRAND MARKS	#	ROW TOTALS
ZONE ONE	#	A B C D E F	#	#
1	3	1 1 1 0 0 0	3	5
2	0	1 2 0 0 0 0	0	3
3	0	0 1 1 0 0 0	0	1
4	1	0 1 0 0 0 0	0	2
5	1	0 2 0 0 0 0	0	3
6	0	0 0 0 0 0 0	0	0
7	1	0 0 0 0 0 0	0	1
8	1	0 1 0 0 0 0	0	2
9	0	0 1 1 0 2 0	0	2
>= 10	2	1 6 0 0 2 0	0	11
COLUMN TOTALS	9	3 15 0 3 0 0	0	30

Eta-squared = 0.146

GRADE: SIX STATEMENT: 20. Operations and Properties

YEARS TEACHING	#	REASONS FOR LOW STRAND MARKS	#	ROW TOTALS
ZONE ONE	#	A B C D E F	#	#
1	1	0 0 3 0 0 1	1	5
2	0	0 2 0 0 1 1	1	4
3	0	0 1 1 0 1 0	0	2
4	1	0 1 0 0 0 0	0	2
5	1	0 1 1 0 0 0	0	2
6	0	0 0 0 0 0 0	0	0
7	0	0 1 1 0 0 0	0	1
8	1	0 0 1 0 0 0	0	2
9	1	0 1 1 0 0 0	0	2
>= 10	3	2 4 0 0 2 0	0	11
COLUMN TOTALS	8	2 15 0 4 2 0	2	31

Eta-squared = 0.205

GRADE: SIX STATEMENT: 21. Measurement

YEARS TEACHING	#	REASONS FOR LOW STRAND MARKS	#	ROW TOTALS
ZONE ONE	#	A B C D E F	#	#
1	0	0 1 1 1 3 0	0	5
2	1	1 1 0 1 1 0	0	4
3	0	1 1 0 0 0 0	0	1
4	0	1 1 0 0 1 0	0	2
5	0	1 1 1 0 0 0	0	2
6	0	0 0 0 0 0 0	0	0
7	0	0 0 1 0 0 0	0	1
8	0	1 1 0 1 0 0	0	2
9	0	0 0 0 0 2 2	1	2
>= 10	0	3 3 2 2 2 1	1	11
COLUMN TOTALS	1	8 5 6 5 9 1	1	30

Eta-squared = 0.115

GRADE: SIX STATEMENT: 22. Geometry

YEARS TEACHING	#	REASONS FOR LOW STRAND MARKS	#	ROW TOTALS
ZONE ONE	#	A B C D E F	#	#
1	0	1 1 0 0 3 0	0	5
2	2	1 0 0 0 1 0	0	4
3	0	0 0 1 0 0 0	0	1
4	0	0 0 0 0 2 0	0	2
5	0	0 0 0 0 2 0	0	2
6	0	0 0 0 0 0 0	0	0
7	0	1 0 0 0 0 0	0	1
8	0	0 0 0 1 1 0	0	2
9	0	1 1 0 0 1 0	0	2
>= 10	2	2 2 2 1 4 1	1	12
COLUMN TOTALS	4	6 4 2 14 1 1	1	31

Eta-squared = 0.080

GRADE: SIX STATEMENT: 23. Graphing

YEARS TEACHING	#	REASONS FOR LOW STRAND MARKS	#	ROW TOTALS
ZONE ONE	#	A B C D E F	#	#
1	0	0 1 1 1 3 0	0	5
2	0	1 1 2 1 0 0	0	5
3	0	0 0 1 0 0 0	0	1
4	0	0 0 0 1 1 0	0	2
5	0	0 0 1 0 1 0	0	2
6	0	0 0 0 0 0 0	0	0
7	1	0 0 0 0 0 0	0	1
8	0	0 0 0 0 1 1	0	2
9	0	1 0 0 0 0 0	0	1
>= 10	1	3 2 2 2 2 1	1	11
COLUMN TOTALS	2	5 6 6 9 2 2	2	30

Eta-squared = 0.198

TABLE 52  
FREQUENCIES OF GRADE SIX TEACHERS  
IN EXPERIENCE CATEGORIES CHOOSING  
REASONS FOR LOWEST MEANS BY STRAND



E. This topic would not receive the instructional emphasis required for mastery.

B. The topic is new understanding will grow with teacher familiarity.

#### Geometry

E. This topic would not receive the instructional emphasis required for mastery.

#### Graphing

E. This topic would not receive the instructional emphasis required for mastery.

A summary and discussion of the questionnaire findings will be included in Chapter XI and utilized in the conclusions of the study.



## I. THE ACHIEVEMENT PROFILES

One of the stated purposes of this investigation was to provide teachers and school supervisors with student achievement results. This was made possible with the design of a computer program which reported the test performances of individual students, schools and school jurisdictions in relation to the specified objectives of the Alberta Program.

Computer printouts for each of the above were sent out to the school districts offices for distribution. This was completed by the researcher in October of 1978 and in July of 1979.

In addition to the individual student and school print-outs, the supervisors were provided additional data in the form of zone and out of zone, male-female and early-late starter comparisons (Appendix J).

A representative sample of fifteen teachers, five principals and five central office supervisors were interviewed concerning their utilization of the materials provided. The interview questioning of these individual had to consider the different procedures that were used for the two years.

The 1978 student print-outs were such that each profile had to be matched with a Student Analysis Form (Appendix F). This was accomplished by a process of matching numbers. Since the forms received from the schools had to be key punched and the analysis program written, the data packages were not sent out to the division offices until October of



1978.

An optically scanned form (Appendix G) designed for the 1979 analysis enabled a July shipment of the information to the jurisdictions. These forms had student names printed directly on the profiles so that no matching of forms was required.

The questions asked during the interviews were as follow: "What use, if any, were you able to make of the print-out information you received?" "What were the main strengths and weaknesses of the profiles?" "What added use do you expect to make of the 1979 forms which will include each student's name and also be available for school opening?"

## J. THE USE OF THE PRINTOUTS

### By teachers

The general conclusion from the teacher interviews was that the computer profiles were not being used as intended. Originally the print-outs were to be of diagnostic value in terms of indicating individual pupil and class errors. Follow-up teaching could then become more purposeful. Teachers on the other hand appear to be more interested in the comparative use of the materials. They were interested in how their class compares with others from within their system and throughout the Zone.

Although the teachers made little diagnostic use of the forms with individual children they did look at the



composite achievement of their students and considered the problem areas as possible reflections of their instructional programs.

The teachers for the most part liked the tests but disagreed with the weighting allotted to the various items. They felt that the transferring of marks to the computer forms and Analysis sheets required excessive time. They liked the idea of having the pupil names on the printouts and thought that better use would be made of these forms.

Teachers also believed that the computer profiles would be utilized to a greater extent if they were available during the year and not after the pupils had moved on to the next grade.

#### By Principals

The reactions of principals to the computer print-outs were much like those of the teachers'. They too were intent on knowing how their schools compared to others. One principal, for example, had drawn a bar graph that showed the performances of his school as compared to the others within his systems and with those of the zone.

Few examples of instructional leadership were noted in terms of helping teachers make maximum use of the print-outs at the pupil level, even though discussion of the results was encouraged in most cases.

A majority of the principals were attempting to incorporate the student profiles within the cumulative record files. One school however had not received the 1978



Student Analysis Forms from the Division Office so it was impossible for him to even identify individual pupils.

A few of the principals and teachers had expressed concerns about the possible use of test information for implicating their competence. This again was a reflection of the emphasis given to comparing test results.

#### Central Office Supervisors

Use of the profile sheets at the jurisdiction level was as varied as at the school level. The political attitude of "how do we stand?", was also in evidence with the supervisors, although there was generally a high degree of interest in improving student performance.

One supervisor held school meetings concerning the test results in an attempt to generate solutions to perceived instructionally weak areas. Another however had forgot about the Student Analysis Form match-up and they remained in his office.

All supervisors expressed an interest for follow up work in their schools relative to improving the mathematics programs being offered their children. They also gave support to the concept of student assessment within their schools.



## CHAPTER XI

### SUMMARY, INTEGRATION, IMPLICATIONS AND RECOMMENDATIONS

#### A. SUMMARY OF THE STUDY

This study, involving a testing program in Zone One of the Province of Alberta, was first of all for purposes of assessing student understanding of the mathematics content as outlined in the Program of Studies for Elementary Schools (1978). Over 12 000 students were involved in the project which was conducted during 1978 and 1979. The information collected from these students during these two testing years was also to be used for diagnostic purposes as a service to teachers, and to school and central office supervisors. To enact this phase, computer profiles were provided to each of the schools and central offices in the Zone.

Another purpose of the study was to use the assessment data as a basis for discussing various implications for the mathematics curriculum.

Here it became obvious that at least two major curriculum facets were being implicated. For example, what aspects of low student achievement could be attributed to the content, organization and the premises upon which the curriculum development took place? Secondly, how much of the blame could be placed on the inadequacies of the procedures used for implementating the curriculum? It was not the intent of this study to establish the exact origin of the



weakness within the curriculum however. Indeed it may be impossible to consider the development and the implementation of a curriculum along with the assessment of students, at least within the context of the same evaluation.

### The Instruments

The test instruments utilized in this study were designed specifically for assessing the achievement of Zone One students in relation to the objectives of the 1977 Elementary Mathematics program. As such they were criterion referenced to the specified content by teachers, supervisors and the researcher who had all been associated with either or both the development and implementation of the new program. The grade one to six tests had been piloted and validated during the year prior to the June 1978 test administration.

### Findings

The findings of the study were reported within the context of six major hypothesis which are contained in the previous seven Chapters of this document.

#### Hypothesis One

Hypothesis one stated that eighty percent of the students in Zone One would not achieve to a criterion level of 85 percent or better in 1978 and 1979 on each of the objectives in the Number, Operations and Properties, Measurement, Geometry, and Graphing strands in grades one to six.



This null hypothesis held for a majority of the objectives. Achievement in the Zone was such that the number of objectives for which eighty percent proportions were recorded decreased with the grades. Grade one had six proportions at the 85-100 percent level, grade two had four, and grade three had two. Only one such proportion was found throughout the whole Division II level.

### Hypothesis Two

This hypothesis stated that there would be no significant difference in the percentage of students achieving within the 85-100 percent category between 1978 and 1979 on each of the objectives in the five strands for grades one to six.

The null hypothesis was not accepted for the majority of objectives in grades one to six. Significantly higher proportions of students in the Zone did reach the 85-100 percent achievement category for 1979. In Division II where there was more room for improvement, more students seemed to improve. For example, of the 79 objectives at the primary level, 34 had significantly more students in the higher category for 1979. Of the 95 objectives in Division II, 59 had significantly higher proportions of students achieving in the 85-100 percent range.

### Hypothesis Three (Early-late starters)

Early starters were those students who commenced grade one younger than 6.0 years of age as of September 5. Late starters were older than 6.0 years as of the same date. For



purposes of identifying the early and late starters in grades two through six, one year was added to a child's birth date for each subsequent grade in school. Hypothesis three said that there would be no significant differences between the early and late starters within each strand for grades one to six.

There were few or no achievement differences between students who started school younger or older at the primary level. There were hints of a difference favoring the grade three late starters but the differences were not significant. However beginning at grade four the late starters significantly outperformed their younger starting counterparts in most strands of the program.

#### Hypothesis Four (Male and Female)

The only area where one sex classification consistently outperformed the other was in the Operations and Properties strand. Here female students did better at all six grade levels. Not only do they do significantly better on the overall strand but also for most of the individual concepts and skills. From responses to the knowledge items it appears that girls have committed more mathematics learning to memory. The one concept area of the strand in which sex difference did not exist was for problem solving. Here both boys and girls had equally low performances.

#### Hypothesis Five (North and South Zone)

Schools north of and including the Peace River School Division were designated as North Zone One. The



jurisdictions within this region included North Peace Separate, Fort Vermilion and the Northland School Divisions. All school systems south of the Peace River District boundary were identified as South Zone One.

The Northland School Division students were tested only at the grades two, four and five levels and their lower achievement scores appeared to have an impact on the subgroup comparisons in which they were involved. With Northland separated out as for grades one, three and six, there were few differences between the North and South Zone School Districts. But when the North was included at grades two, four and five differences favored the South Zone.

It is important to recognize again however that there are many factors that would influence achievement in the Northland system. The majority of children entering grade one do not speak English as a first language. The actual time that pupils spend on the individual content objectives because of attendance problems or supervisory adjustments to the Alberta program likely have an effect. Teacher mobility and the sociological-environmental conditions may also contribute to the lower performances.

#### Hypothesis Six (Public and Separate Schools)

Public students attended schools that are operated by publicly designated boards. Separate school pupils attend those institutions that are designated as Roman Catholic by faith.

Once again the Northland School Division as a Public



system appears to influence the achievement picture. Public and Separate school differences were not significant in grades one, three and six where the system in question was not involved. Most of the achievement differences favoring the Separate school pupils were in grades two, and five (10/13). Also most of the Public student advantages were in grades one, three and six. Another interesting comparison was between the testing years. Of the thirteen statistically higher achievement ratings in favor of Separate systems, all were in 1979. Fifteen of the sixteen achievement cells that favored the public schools were in the 1978 testing year.

## B. THE QUESTIONNAIRE

### Part I

According to the Zone One teachers the pupils within their respective school districts failed in their attempts to reach the highest achievement category (85-100 percent) for two equally popular reasons. They suggest that the problems arise because the textbooks that are currently authorized do not match the program objectives. Teachers also say that pupils have inadequate learning skills to enable them to master the program. In other words they feel that the difficulties lie with the pupil and the materials from which they are required to teach.

The factors that teachers thought were least likely to be responsible for the low student proportions in Category D were varied. Grades one and two teachers said that neither



the program nor the test difficulty would be at fault. Grade three teachers chose the sequencing of content in the textbook and the keeping track of students performance and follow-up as the least likely factors. Division II teachers collectively agreed that neither the problems associated with keeping track of students performance nor the difficulty of the program should be responsible for the lack of achievement within the 85-100 percent level.

### Part II

The two most popular factors that teachers of grades one to six thought would be at work in any good mathematics program were: first, an instructional plan that would involve good teachable materials, and; secondly, a program that could be geared to the ability level of all children.

They considered that grouping children for need, ability or interest purposes would be of little importance to an effective program. Teachers chose the professional training of instructors as an equally non-important factor.

### Part III

This aspect of the questionnaire centered on what teachers thought to be the main causes for the lowest achievement scores within each of the strands. They were to respond in terms of each strand separately but for only one grade which they taught.

The number objectives related to place value had consistently lower scores on the 1978 tests. Teachers reported that the main reason for students failure was



because they had not mastered the concepts upon which the concept in question was dependent.

Problem solving was the main weakness in the Operations and Properties strand and the most common reason the teachers cited as the primary cause was the same as for place value; that students had not mastered the previous concepts in the hierarchy.

Almost without question the most popular response with regard to the low achievement performances in the Measurement, Geometry, and the Graphing strands was that the topics would not receive the instructional emphasis required for mastery.

Teachers appear to be saying that the Number, and the Operations and Properties strands are to be considered the most important and that the lack of pupil learning within these strands is due primarily to pupil inadequacies.

### C. INTEGRATION OF THE STUDY FINDINGS

The intent of this section of the report is to attempt to draw together the various segments into a more comprehensible whole. This integration should enable a better base upon which to make recommendations for program change or future research.

#### The Zone One Tests

Although teachers in the zone did not blame the test instruments for any particular failures which their students experienced, the difficulty level of the Division II items



still may be influencing the lower achievement figures reported there.

For the most part the items appear to have been well referenced to objectives in the program of studies. However when compared to some of the instruments used in assessment (British Columbia and Alberta) and standardized testing (Canadian Test of Basic Skills), the Zone One items seem to be more demanding. Multiple choice items were all but non-existent and the many complicated completion type items, particularly at the division II level, were more open to computational error.

Also the test instruments were to be diagnostic in nature, however the clustering of the individual items for analysis of achievement by objective decreased the diagnostic value of the tests. Rather than being able to pinpoint a specific weakness such as the students' ability to identify the zero (0) as a place holder, the deficiency could only be regarded as a lack of place value or operational understanding.

Regardless of any particular weakness which may be directed at the instruments used in this study, the questionnaire data does support the validity of the tests upon which this study was based. According to the teachers the Zone One instruments were valid for the purposes of assessing student understanding and for evaluating the elementary mathematics program.



### Student Achievement

There is good evidence to suggest that children come well equipped to handle the entry year of the elementary mathematics program. The results indicate that grade one students do experience success. One may even extend this assessment to many areas of the grades two and three program as well. However pupil achievement in mathematics is relatively low at the Division II level.

Yet many of the difficulties that predominate in grades four, five and six have their beginning at the primary level. The place value concepts, vitally important to the total program, starts its failing trend in grade one. Pupils begin to show a lack of understanding of the processes or actions involved in the operations at the grade one level as well.

Although the grade one pupils demonstrate a high level of recall of the basic facts, the grade two's begin to show a deficiency in this skill. This lack continues throughout the elementary grades and likely hampers some of the opportunities that students have for success in other areas. Teachers recognized this weakness in that they considered their students not to have mastery that would allow for the successful achievement of other dependent concepts.

The power of the textbook may be coming out in this study. Certainly the teachers rated it high as a reason for not being able to bring more students within the higher achievement category. How much influence the textbooks have



on the achievement at the higher grades is perhaps speculative although there may be some relationships. For example an investigation conducted by the Ad Hoc Committee found during the development of the elementary program that the higher the grades the fewer the program objectives that are being treated in the authorized textbooks.

The problems that students have, from grade two and on, with regard to the introduction of the new (eg. multiplication after addition) operations, is likely a shared responsibility of the program, textbooks and the teachers handling of the instructional plans. This weakness is evidenced by the achievement figures that show students to have increasing difficulties as the multiplication and division operations are incorporated into the program sequence with addition and subtraction.

The problems associated with the treatment of the operations may be in part responsible for the lack of performance in problem solving. From the time the process is introduced in grade two to the grade six level children do poorly.

The performance on Metric Measurement seems to deteriorate immediately following the successful introduction of non-standard measurement in grade one. It appears as though the grades four, five and six students have not had the opportunity to explore the metric concepts they would miss by coming into the program upstream. Students have utilized the Metric Systems for, at most, two



years.

#### D. IMPLICATIONS FOR THE CURRICULUM

Some of the difficulties that appear to thread through the scope and sequence of mathematics objectives, grades one to six, may be due to particular weaknesses within the program and or with the inadequacies of the implementation process. It was not the intention of this study to delineate the causes so much as to find out if and where problems do exist. However it is possible to speculate about some of the apparent weaknesses that could influence the opportunities that children have to learn the mathematics that is intended for them.

One important consideration is that it does not appear to be sufficient to simply list the objectives within the strands and expect that the proper sequencing will be managed. Unless the textbooks do a better job of covering the content they too cannot provide the necessary bridging and spacing of the elementary mathematics content.

Pupil achievement in the area of place value may be an indication that methodology is not to be ignored. If the skills associated with place value are handled primarily in the abstract and in conjunction with the operations, students will likely continue to be frustrated.

Along this same line, the weaknesses that are associated with the money objectives may be in part due to their treatment in isolation from the supporting objectives



in the Number and the Operations and Properties strands. This may also be applicable to the constructing of graphs.

The suggestion made in the Elementary Mathematics Handbook (1977) in relation to the importance of problem solving should be taken seriously. If it is as indicated "a unifying process which permeates all the strands of the program" (p. 21), then perhaps it should be given more treatment. Perhaps the topic of problem solving is important enough to have its own scope and sequence. Perhaps the topics within the other strands could be developed within the context of problem solving rather than the reverse.

The premise that commitment to memory is a negative influence on student understanding may be at work in the current program. The importance of memory storage, especially of the basic facts, should not be understated.

#### **E. RECOMMENDATION FOR FURTHER RESEARCH**

One major recommendation would be to reconsider the scope and sequence of the current program of studies for elementary school mathematics. Hopefully what would emerge is a more detailed plan that would pay more careful attention to sequencing in particular.

The diagnostic aspect of this study did not pin point for the teachers the specific problems which hinder student achievement in elementary school mathematics. The next step to a study such as this may be the development of programs to help teachers better diagnose the isolated mistakes and



patterns of errors that children make, then to help build plans for the necessary corrective action.

Research should be conducted into the reasons why Zone One students have so much difficulty with problem solving.

There is also room for more study into the curriculum and instruction of the Metric System of measurement within the elementary grades. More information is available now than was at the time of the program development in 1975 and 1976.

The above comment may also apply to the topic of transformational geometry although the main concern here is perhaps with the concepts and where they are to extend in subsequent geometry programs.

Another area that should be investigated is the degree to which teachers are able, through preparation or formal training, to diagnose pupil errors in mathematics and to prescribe effective treatment strategies to the difficulties revealed.

Finally one important area that this study failed to explore is that of the affective realm of the student. The feelings and attitudes of these children may turn out to be highly significant.



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A P P E N D I X    A

THE AD HOC COMMITTEE'S  
COMBINED SCHOOL ANALYSIS - QUESTIONNAIRE



## COMBINED SCHOOL ANALYSIS

## Elementary School Mathematics

Goals and Tentative Outline

## Questionnaire

I am a

- ☐ teacher of grade \_\_\_\_\_
- ☐ principal
- ☐ other (Please Specify) \_\_\_\_\_

Goals

After studying "The Goals of Elementary School Mathematics" I would like to make the following comments:

Tentative Outline

1. Could the majority of your pupils master the core program (objectives without asterisks)?
  
  
  
  
  
  
  
  
  
  
2. Do the optional areas (objectives with asterisks) provide sufficient enrichment and extension to meet the special needs and interests of pupils in your school or school system?







12. The core objectives in this strand represent at least a minimum level of content.

13. The use of metric units as the only standard units of measure to be taught is good.

14. The sequence of introducing the metric units (m, cm, dm, l, kg, km, ml, g, tonne, mm) is a logical order.

15. There is too much emphasis on time.

16. Money should be introduced earlier in the core section.

17. The sequence of introducing metric units parallels the sequence of introducing decimals.

18. There should be more mention of the British units of measure.

19. The sequence of concepts in this strand from level A to level F seems logically developed.

20. The core objectives in this strand represent at least a minimum level of content.

21. Beginning with 3-dimensional figures (A-IV-1) is not realistic.

22. There is too much emphasis on classifying.

23. Removal of the point-set approach (points, lines, open and closed curves, etc.) from the primary grades is a backward step.

24. The sequence of concepts in this strand from level A to level F seems logically developed.

8/67/1/2/0

20/20/5/4/1

8/36/5/0/2

10/2/11/2012

0/15/10/12/9

1/29/18/8/0

20/6/630/9

3/48/8/0/1

11/35/1/2/0

3/7/8/20/11

21/12/29/5

07/12/20

4/33/1242/



[illegible]

28. There is an adequate emphasis on skill development.

29. There is sufficient provision for problem solving activities.

30. There is a good balance between theory and application.

31. Please make specific comments on the "Tentative Outline." (Some of the above statements may provide the stimulus for some comment.)

Dr. W. George Cathcart  
Department of Elementary Education  
University of Alberta  
Edmonton, Alberta  
T6G 2G5



A P P E N D I X     B

THE QUESTIONNAIRE



THE ZONE ONE ELEMENTARY  
MATHEMATICS TESTING PROJECT

QUESTIONNAIRE

(Following the working paper on Mastery Learning)

November, 1978

Please return to:

Alberta Education  
Field Services Branch  
500 Nordic Court  
10014 - 99 Street  
Grande Prairie, Alberta  
T8V 3N4







## Questionnaire

Page 2

I. Below is a list of possible factors, labeled four (4) through eleven (11) that might influence the opportunities students have to achieve mastery (85% or above) levels on the elementary mathematics objectives.

4. There is a lack of good materials for teaching certain objectives.
5. Textbooks do not match the program objectives.
6. The program objectives for my grade level are too difficult.
7. The test items for my grade level are too difficult.
8. The varied abilities of my students makes instruction difficult.
9. The sequencing of content in our textbook is inappropriate.
10. Keeping track of failure and successes and subsequent follow-up is too difficult.
11. Students fail to master objectives because of inadequate learning skills (e.g., forgetting).

Please rank each of factors 4 through 11 as follows. From one (1) the factor you think most likely explains why students in your system did not master the mathematics objectives, to eight (8), the factor you think least likely explains why students did not master the mathematics objectives (below 85%) (omit the zero (0))

NOTE: - only 8 factors.

	A	B	C	D	E	F	G	H	I	J
4	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
5	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
6	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
7	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
8	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
9	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
10	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F	G	H	I	J
11	0	1	2	3	4	5	6	7	8	9

e.g. second most likely . . .

e.g. if you think 6 is the most likely factor, pencil in (1).

e.g. if you think 9 least likely explains, pencil in (8).



## Questionnaire

Page 3

I. The following factors might be those which would contribute to a successful mathematics program in any school. (Factors labeled 12-18 for answer sheet purposes only.)

12. A instructional plan involving good teachable materials.
13. Textbooks that students like and which cover the program objectives.
14. A management plan that includes help for marking and ways and means of keeping track and following up with students.
15. A program that is geared to the ability levels of all children.
16. A classroom of children grouped so that their needs, abilities and interests are alike.
17. The professional training of the teachers in our system.
18. The continuous (inservice) education of teachers in our system in mathematics.

Please rank factors 12 through 18 as follows. From one ① the factor you think is the most important contributor for a successful mathematics program to seven ⑦ the factor you think is the least important for a successful mathematics program. (Omit the zero ①.)

	A	B	C	D	E	F	G	H	I	J
12	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
13	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
14	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
15	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
16	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
17	①	②	③	④	⑤	⑥	⑦	⑧	⑨	
	A	B	C	D	E	F	G	H	I	J
18	①	②	③	④	⑤	⑥	⑦	⑧	⑨	



- II. The third section of this questionnaire deals with the composite achievement scores of students at the Zone One level. For your reference the lowest non-mastery scores are recorded for objectives under each of the five strands, grades one to six. The concept areas are abbreviated also. Answer the questions which follow only for the grade you teach.

Grade One

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
5. Actually tests objective	2. Symbolizes addit. & subtr. sit.	6. Recognizes coins & other values	<u>Mastery</u>	1. Graphing data
6. renaming	73.9%	68.3%		78.6%
72.7%				

Grade Two

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
5. place value	5. Solves picture & word problems	4. Months in order	3. Geometric pattern	1. Construct bar & pictograph
65.1%	50.0%	49.2%	75.0%	69.4%

Grade Three

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
4. place value	9. solves word problems	9. linear meas. to tenths	4. Corresponding parts	1. the axis
45.4	56.0%	38.2%	48.8%	48.1%

Grade Four

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
8. tenths hundredths	3. Rounding	9. linear meas. to hundredths	2. Axis of symmetry	4. ordered pairs
9.6%	37.0%	12.8%	44.4%	45.6%

Grade Five

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
3. place value to 0.001	6. Solve word problems	9. equivalent measures	2. Corresponding parts	4. radius diam. & circumferences
36.4%	35.0%	27.2%	38.2%	41.8%

Grade Six

<u>Number</u>	<u>Oper. &amp; Prop.</u>	<u>Measurement</u>	<u>Geometry</u>	<u>Graphing</u>
3. decimals & expanded notation	6. Mult. & divides decimals	6. interrelationships	3. Constructs 3-D figures	2. ordered pairs
40.1%	35.5	25.9	43.7	59.9



## Questionnaire

Page 5

The following factors are those which may have contributed to the non-mastery status of Zone I students who, taken together, contributed to the lowest scores on the indicated objectives.

- A. Students traditionally have difficulty with this topic.
- B. The topic is new. Understanding will grow with teacher familiarity.
- C. Students have not mastered previous concepts upon which this concept is dependent.
- D. Instructional materials are lacking in this area.
- E. This topic would not receive the instructional emphasis required for mastery.
- F. This concept is beyond the ability of children at this particular grade level.

Which of the above factors do you think best explains the lowest Zone I scores in each of the five strands as outlined below. (Answer for the grade level you recorded in item one.)

19. Number

A B C D E F G H I J  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Pencil in your choice of  
 factors A, B, C, D, E, or F.  
 e.g. ① ② ③ ④ ⑤

20. Operations and Properties

A B C D E F G H I J  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

21. Measurement

A B C D E F G H I J  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

22. Geometry

A B C D E F G H I J  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

23. Graphing

A B C D E F G H I J  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨



## A P P E N D I X C

## SUMMARY OF PILOTING DATA



## GRANDE PRAIRIE SCHOOL DISTRICT #2357

## - Elementary Mathematics Testing Project -

## Summary of Trial Administration Data

## Grades, One, Two, and Three

I. Background

During the 1976/77 school term, teachers in the District developed test items to match the objectives of the Alberta Education 1977 Mathematics Program.

During the 1977/78 school term, these items were organized into pilot tests by Al Anderson, Education Consultant, and Keith Wagner, Deputy Superintendent.

In December, 1977, and January, 1978, teachers in the District administered the tests to students in the grade level one grade beyond the grade the test is intended for. (That is, Grade Two students wrote the test intended for Grade One). The results are recorded on the following pages.

II. Purposes of Pilot

The purpose of this administration was to pilot the items. Scores were compiled because it was considered they would be useful information to assist in making judgements regarding the face validity of the items. These scores should in no way be considered a measure of the mathematics competence of students in the District.

If scores for an item are unduly low by comparison with overall scores, the following questions will be considered by a panel of teachers, the Deputy Superintendent, and the Education Consultant:

1. Is the item undesirable in some way?  
That is, could it be confusing to a student and thus not really measure his knowledge of the objective?
2. Could students have achieved poorly because the program they were exposed to in the previous year did not contain the objective being measured?  
If so, the question may well be suitable.

It is hoped that revisions based on this type of analysis will result in a final test instrument that will accurately reflect the competence of the students, objective by objective.



Number of Classes = 11 Number of Students = 233		Total Possible	Total Actual	% Of Achievement
<u>NUMBER</u>				
1.	Matches members of two sets and determines equivalent and non-equivalent sets.	1,398	1,349	96.49
2.	Describes relationships such as more, fewer, greater than, less than, equal to. (no symbols)	1,398	1,234	88.26
3.	Associates a numeral with equivalent sets. (0-9) Cardinality.	2,330	2,313	99.27
4.	Demonstrates knowledge of the order property of numbers by ordering sets by relative size, by counting, and by arranging digits in order. (Ordinality)	1,864	1,636	87.77
5.	Reads and writes numerals. (0-99)	-	-	-
6.	Identifies and renames the number of 10's and the number of 1's in any 2 digit number.	2,330	1,522	65.32
		9,320	8,054	86.42
<u>OPERATIONS AND PROPERTIES</u>				
1.	Understands the process of addition and subtraction.	932	912	97.85
2.	Symbolizes addition and subtraction situations.	2,330	1,798	77.16
3.	Demonstrates mastery of the basic facts involving sums and minuends through 9.	3,728	3,442	92.33
		6,990	6,152	88.01
<u>MEASUREMENT</u>				
1.	Tells the time to hour.	466	447	95.92
2.	Recites the days of the week in order.	233	202	86.70



Compares two or more objects as shorter than, longer than, thinner than, thicker than, heavier than, lighter than, etc.	699	666	95.28
Estimates and measures using non-standard units of capacity, mass and linear measures.	699	590	84.41
Identifies instruments for measuring time, mass, length, capacity and temperature.	1,165	1,057	90.73
Recognizes pennies, nickles, dimes and quarters, and the value of each.	699	639	91.42
	3,961	3,601	90.91
<u>OMETRY</u>			
Classifies, by manipulation, 3-dimensional objects according to various attributes.	932	358	38.41
Recognizes and names: circle, square, triangle, rectangle.	932	869	93.24
	1,864	1,227	65.83
<u>PHING</u>			
Collects data from immediate environment and constructs graphs using pictures or objects.	1,165	757	64.98
	1,165	757	64.98



Number of Classes = 9 Number of Students = 226		Total Possible	Total Actual	% Of Achievement
<u>NUMBER</u>				
1.	Identifies the cardinal number associated with a set of objects.	5,424	5,004	92.26
2.	Orders numerals and recognizes "betweenness." (0-100)	4,520	4,416	97.70
3.	Reads and writes numerals. (0-999)	5,424	5,308	97.86
4.	Names ordinals first to tenth.	5,424	5,108	94.17
5.	Identifies the number of 100's, 10's and 1's in a given three-digit numeral.	5,424	5,176	95.43
6.	Identifies multiples by counting by 5's, 10's and 100's.	6,328	6,048	95.58
7.	Identifies and represents fractions (halves and quarters) in a concrete setting.	3,616	2,824	78.10
		36,160	33,884	93.71
<u>OPERATIONS AND PROPERTIES</u>				
1.	Symbolizes addition and subtraction situations in both the horizontal and vertical form.	1,808	1,176	65.04
2.	Understands the basis of the commutative property for addition.	2,712	1,951	71.94
3.	Understands the processes of multiplication and division.	2,712	1,556	57.37
4.	Demonstrates mastery of basic facts involving sums and minuends to 18.	7,232	5,474	75.69
5.	Solves picture and word problems. Estimates answers.	5,424	2,641	48.69
6.	Adds and subtracts to 99 with no regrouping.	7,232	5,801	80.21
		27,120	18,599	68.58



REQUIREMENT			
Tells the time to hour, half hour, and quarter hour.	452	385	85.18
Writes the hour, half hour and quarter hour using standard notation.	452	266	58.85
Reads the dates on the calendar.	904	639	70.69
Recites months of the year in order.	904	464	51.33
Estimates and uses standard units of length, capacity, and mass, m, cm, l, kg .	2,712	1,426	52.58
Identifies proper measuring instruments for a given task.	2,712	2,504	92.33
Reads the Celsius thermometer to ten degree intervals.	904	687	76.00
Counts collections of coins up to 25¢.	904	715	79.09
Gives equivalent value of coins to 25¢.	2,712	2,250	82.96
Makes purchases up to 25¢.	904	757	83.74
	13,560	10,093	74.43
ENTRY			
Classifies 3-dimensional objects in relation to corners, edges, and faces.	1,808	1,270	70.24
Classifies 2-dimensional figures in relation to boundaries, corners and faces.	1,808	1,270	70.24
Develops geometrical patterns using 3-dimensional objects and 2-dimensional figures.	2,712	1,990	73.38
	6,328	4,530	71.59



GRAPHING			
Constructs simple bar and pictographs using data collected from immediate environment.	2,712	1,526	56.27
Locates position of an object on a 10 x 10 grid.	4,520	3,819	84.49
	7,232	5,345	73.91



Number of Classes Number of Students	Total Possible	Total Actual	% Of Achievement
<u>NUMBER</u>			
Orders and determines "betweenness" of whole numbers (0-1 000) and understands symbols $>$ , $<$ and $=$ to show relationships.	4,040	3,562	88.17
Identifies multiples by counting by 2's, 5's, 10's, 25's, 100's (0-1 000).	3,232	2,436	75.37
Reads and writes numerals. (0-9 999).	6,464	5,832	90.22
Identifies the number of 1 000's, 100's, 10's, 1's and tenths.	2,424	878	36.22
Rewrites numbers in expanded notation (0-1 000) and vice versa.	3,232	2,644	81.81
Reads and writes decimals to tenths.	3,232	3,152	97.52
Identifies, writes and compares fractions from physical representation (halves, quarters, tenths, and fifths).	4,848	2,999	61.86
	27,472	21,503	78.27
<u>OPERATIONS AND PROPERTIES</u>			
Identifies additive, subtractive, multiplicative and divisive situations.	2,424	1,848	76.24
Adds and subtracts two or three digit numbers with and without regrouping.	4,848	3,952	81.52
Symbolizes multiplication and division situations.	1,616	1,450	89.73
Identifies related sentences for addition, subtraction, multiplication and division.	2,424	1,709	70.50
Understands the basis of the commutative property of addition and multiplication.	1,616	1,229	76.05
Understands the unique effect of 0 and 1 in addition and multiplication respectively.	1,616	1,210	74.88
Demonstrates mastery of basic facts involving sums, minuends, products and dividends to 18.	4,848	3,679	75.89



8. Multiplies whole numbers by 10 and 100.	1,616	1,414	87.50
9. Solves word problems. Estimates answers.	3,232	1,618	50.06
	24,240	18,109	74.71
<u>MEASUREMENT</u>			
1. Tells and writes the time to the nearest hour, half hour, quarter hour and five minute intervals.	808	697	86.26
2. Knows the months of the year in order.	808	572	70.79
3. Uses noon, midnight, a.m. and p.m.	1,616	1,399	86.57
4. Counts collections of coins up to \$1.00.	1,616	1,262	78.09
5. Makes purchases and change up to \$1.00.	1,616	735	45.48
6. Read Celsius thermometer to one degree intervals.	808	604	74.75
7. Extends estimation and measurement to include the use of the standard units km, dm.	2,424	1,026	42.33
8. Uses standard instruments, (metre stick, litre container, mass scales, calendar, Celsius thermometer).	4,040	3,006	74.41
9. Expresses linear measurement to the nearest tenth.	808	56	7.93
	14,544	9,357	64.34
<u>GEOMETRY</u>			
1. Classifies and identifies 2-dimensional figures and 3-dimensional objects.	1,616	1,500	92.82
2. Constructs 2-dimensional figures using straws, pipecleaners, wires, geoboard, etc.	2,424	2,244	92.57
3. Constructs 3-dimensional objects with Plasticine or modeling clay.	4,040	1,632	40.40
4. Recognizes corresponding parts in polygons.	808	386	47.77
	8,888	5,762	64.83



PHING			
Identifies the axes.	404	90	22.28
Collects data and constructs simple bar, line and pictographs.	2,424	934	38.53
Locates position of an object on a grid.	2,020	900	44.55
Plots points on a grid when given the two co-ordinates.	808	470	58.17
	5,656	2,394	42.33



## A P P E N D I X D

## THE CLASS ANALYSIS FORM



GRADE FIVE MATHEMATICS TESTCLASS ANALYSIS FORM

Teacher \_\_\_\_\_

School \_\_\_\_\_

*This form is to be kept in the school records, and a copy is to be sent to Central Office to assist in a District analysis of results and norming process.*

NUMBER OF STUDENTS IN CLASS = X = \_\_\_\_\_

NUMBER	OBJECTIVE	POSSIBLE	ACTUAL
	1	20x	
	2	20x	
	3	14x	
	4	20x	
	5	16x	
	6	16x	
	TOTAL:	106x	
OPERATIONS & PROPERTIES	OBJECTIVE	POSSIBLE	ACTUAL
	1	8x	
	2	6x	
	3	6x	
	4	8x	
	5	16x	
	6	28x	
	7	18x	
	TOTAL:	90x	
MEASUREMENT	OBJECTIVE	POSSIBLE	ACTUAL
	1	2x	
	2	4x	
	3	3x	
	4	4x	
	5	3x	
	6	2x	
	7	7x	
	8	6x	
	9	7x	
	10	4x	
	TOTAL:	42x	



## A P P E N D I X E

## DETAILED MARK WEIGHTING EXAMPLE



DISTRIBUTION OF MARKS  
BY STRAND

<u>Number Strand</u>				
Obj. 1	20 marks	Obj. 4	20 marks	
Obj. 2	20 marks	Obj. 5	16 marks	
Obj. 3	14 marks	Obj. 6	16 marks	
TOTAL		54	+	52 = 106 marks

<u>Operations and Properties Strand</u>				
Obj. 1	8 marks	Obj. 5	16 marks	
Obj. 2	6 marks	Obj. 6	28 marks	
Obj. 3	6 marks	Obj. 7	18 marks	
Obj. 4	8 marks			
TOTAL		28	+	62 = 90 marks

<u>Measurement Strand</u>				
Obj. 1	2 marks	Obj. 6	2 marks	
Obj. 2	4 marks	Obj. 7	7 marks	
Obj. 3	3 marks	Obj. 8	6 marks	
Obj. 4	4 marks	Obj. 9	7 marks	
Obj. 5	3 marks	Obj. 10	4 marks	
TOTAL		16	+	26 = 42 marks

<u>Geometry Strand</u>				
Obj. 1	12 marks	Obj. 3	8 marks	
Obj. 2	8 marks	Obj. 4	7 marks	
TOTAL		20	+	15 = 35 marks

<u>Graphing Strand</u>				
Obj. 1	9 marks	Obj. 4	4 marks	
Obj. 2	6 marks	Obj. 5	4 marks	
Obj. 3	4 marks			
TOTAL		19	+	8 = 27 marks

T O T A L = 300 marks



GRADE FIVE MATHEMATICS TESTPART IIDETAILED ANALYSIS OF MARK WEIGHTINGS

PART	QUESTION	STRAND	OBJECTIVE	RAW SCORE VALUE
II	1	Measurement	1	1
II	2	Measurement	1	1
II	3	Measurement	2	4
II	4	Measurement	3	3
II	5	Measurement	4	4
II	6	Measurement	5	3
II	7	Measurement	6	2
II	8	Measurement	7	3
II	9	Measurement	7	4
II	10	Measurement	8	6
II	11	Measurement	9	1
II	12	Measurement	9	2
II	13	Measurement	9	4
II	14	Measurement	10	4

S U B - T O T A L = 42

SUB TOTAL  $\div$  3 = 14%



## A P P E N D I X F

THE STUDENT ANALYSIS FORM - 1978



School \_\_\_\_\_  
System \_\_\_\_\_

xi (a)

GRADE FIVE MATHEMATICS TEST

School \_\_\_\_\_

STUDENT ANALYSIS FORM - PAGE 1Name: \_\_\_\_\_ Grade 5 Male or Female \_\_\_\_\_ Birthdate: \_\_\_\_\_- P A R T I -QUESTION BASIS

NO..	POSSIBLE	ACTUAL
1	20	
2	20	
3	8	
4	6	
5	20	
6	16	
7	10	
8	6	
9	8	
10	6	
11	6	
12	4	
13	4	
14	6	
15	6	
16	8	
17	8	
18	6	
19	6	
20	6	
21	4	
22	4	
23	4	
24	4	
Total	196	

OBJECTIVE BASISNUMBER STRAND

OBJ.	CORRS. QUES.	POSSIBLE	ACTUAL
1	1	20	
2	2	20	
3	3, 4	14	
4	5	20	
5	6	16	
6	7, 8	16	
TOTAL:		106	

OPERATIONS AND PROPERTIES STRAND

OBJ.	CORRS. QUES.	POSSIBLE	ACTUAL
1	9	8	
2	10	6	
3	11	6	
4	12, 13	8	
5	21,22,23,24	16	
6	14,15,16,17	28	
7	18, 19, 20	18	
TOTAL:		90	



## A P P E N D I X   G

THE ANSWER SHEET - 1979



## IMPORTANT DIRECTIONS FOR MARKING ANSWERS

## EXAMPLES

0	1	2
0	●	2
B		
0	1	2
0	1	2

[illegible]

- **Use black lead pencil only (Hb or softer)**

● **DO NOT use ink or ballpoint pens**

- **Make heavy black marks that fill the circle completely**

- **Erase cleanly any answer you wish to change**

- **Make no stray marks on the answer sheet**

# IMPORTANT

● Please use the Direction pages to record your school system, school, Early and Late codes and student name.

● After correcting student tests use the Answer Key and Teachers Guide to accurately transfer the one or two digit responses to this sheet.

Example: For questions with one digit totals fill in only the ones column. For questions with two digit totals use the tens and the ones column.

## EXAMPLES

FOR A SCORE OF 4 OUT OF 5	FOR A SCORE OF 8 OUT OF 20
<p>1. <i>Very good</i></p> <p>2. <i>Very good</i></p> <p>3. <i>Very good</i></p> <p>4. <i>Very good</i></p> <p>5. <i>Very good</i></p> <p>6. <i>Very good</i></p> <p>7. <i>Very good</i></p> <p>8. <i>Very good</i></p> <p>9. <i>Very good</i></p> <p>10. <i>Very good</i></p> <p>11. <i>Very good</i></p> <p>12. <i>Very good</i></p> <p>13. <i>Very good</i></p> <p>14. <i>Very good</i></p> <p>15. <i>Very good</i></p> <p>16. <i>Very good</i></p> <p>17. <i>Very good</i></p> <p>18. <i>Very good</i></p> <p>19. <i>Very good</i></p> <p>20. <i>Very good</i></p>	<p>1. <i>Very good</i></p> <p>2. <i>Very good</i></p> <p>3. <i>Very good</i></p> <p>4. <i>Very good</i></p> <p>5. <i>Very good</i></p> <p>6. <i>Very good</i></p> <p>7. <i>Very good</i></p> <p>8. <i>Very good</i></p> <p>9. <i>Very good</i></p> <p>10. <i>Very good</i></p> <p>11. <i>Very good</i></p> <p>12. <i>Very good</i></p> <p>13. <i>Very good</i></p> <p>14. <i>Very good</i></p> <p>15. <i>Very good</i></p> <p>16. <i>Very good</i></p> <p>17. <i>Very good</i></p> <p>18. <i>Very good</i></p> <p>19. <i>Very good</i></p> <p>20. <i>Very good</i></p>

0	1	2
0	1	2
●	1	2
B		

0	1	2
0	1	2
0	1	2
A		

[illegible]



## A P P E N D I X H

### THE ADMINISTRATIVE DIRECTIONS



NE ONE



COORDINATOR  
AL ANDERSON  
5804 - 109th AVENUE  
EDMONTON, ALBERTA  
T6A 1S2

May 4, 1979

Dear Teacher,

Thank you for participating in year two of the Zone I Elementary Mathematics Testing Project.

As indicated earlier, for cost and comparative reasons the tests will be identical to the 1978 forms. Should some type of testing continue for next year, suitable alterations will be made for that re-printing.

#### ADMINISTRATIVE DIRECTIONS

The following errors were notes from your communications. Please ensure that they are recorded in your Teachers' Guides and Answer Keys.

#### Grade I

- (a) Question #13, Geometry, Measurement Graphing Strand. This item is judged as measuring the value of coins - have the students do the item even though it may be inappropriate.
- (b) Question #21, (lab section). Use the 50 ml to have each student fill only one of the larger containers. The specifying of these containers is for uniformity purposes. The item is intended to measure non-standard units as the objective states.
- (c) Question #22, (lab section) should be revised in the Teachers Manual according to the directions given in the Answer Key; Specifically, five - 4 g boxes are required.

#### Grade II

- (a) Question #11, Measurement, Geometry Graphing Strand. Answers are wrong if the order is incorrect however, do not deduct for missing commas.

#### Grade III Answer Key

- (a) Question 30, Number. The marks for this question were in error given to objective 5 in the Operations and Properties strand. This has been corrected by computer.



NE ONE



COORDINATOR  
AL ANDERSON  
5804 - 109th AVENUE  
EDMONTON, ALBERTA  
T6A 1S2

- (b) Question #8, Number, Operations and Properties Strand. The answer should be 11.6 not 11.5.
- (c) Question #10, Measurement, Geometry and Graphing. If the student gives all the correct points but leaves the line, give 3 marks.
- (d) Question #20 and 21, (pg. 9 and 10) of the Geometry, Measurement Graphing Strand. The marks for these questions are correctly given in the Answer Key. The computer makes the adjustment for analysis.

#### Grade IV

- (a) Question #13, page 4, Number. Students may need help to see that a one number response is required for each section. e.g. not 6, .8, .13 for A.
- (b) Question #7, on page 2 of Number, A Crayon is not necessary - pencil shading will do.
- (c) Question #24, on page 9. Operations and Properties. This item relates to a grade 5 objective. We will take that into account.

#### Grade VI - Answer Key - Operations and Properties

- (a) Question #4-B, page 2. The answer should read hundreds, not thousands.
- (b) Question #14, page 6. The answer should be 365940.
- (c) Question #16-d, page 7, The answer should read 6.7 not 27.608.

There may be other questionable aspects within each test. Please try to bear with them.

Please examine the directions on the Zone One Elementary Mathematics Tests Answer Sheets. Because ~~over~~ 14000 students are being tested it will be impossible for us to check them over. Soft pencil must be used to fill in the complete circles as shown in the example. If this is not done carefully, the optical scorer will not record the student responses. You might wish to check your student Answer Sheets prior to sending them in. Please note the solution for transferring the 49 questions in Part I of Grade 3 to Answer sheets.

The optical scoring system will speed the analysis process up. Should you wish to administer the tests during the first week of June (4 - 11), I will endeavour to return them to your schools prior to June 30. At any regard we should not be facing the delays we did last year.

Sorry that we cannot eliminate the marking and mark transferring time.



NE ONE



COORDINATOR  
AL ANDERSON  
5804 - 109th AVENUE  
EDMONTON, ALBERTA  
T6A 1S2

### THE LAB MATERIALS

1. Make sure that all of your lab materials are available prior to your testing sessions.

The materials listed by grade are those items required for the lab sections of each test.

#### Grade 1

- o 1. A flannelboard or magnetic board and felt or magnetic shapes (most schools have these).
- \* 2. Paper clips - 10 per student  
3 boxes per class (100 each box)
- 3. Wooden pegs - Scholars Choice  
200 per school is adequate  
(Note: Scholars Choice cannot supply these. I have taken the liberty of having Spectrum supply an alternate.)
- \* 4. One 50 ml, one 250 ml, one 400 ml  
F Tri-Pour Beaker Set (set of 6) from Spectrum
- \* 5. Ten 10 gram mass chips. M Primary  
Mass Set from Spectrum
- o 6. 5 small boxes (match box size) with  
a mass of about 4 g each (tape up for strength).
- \* 7. 1 balance scale (including 2 buckets)  
from Spectrum

\* The lab materials ordered by your school or central office.

o To be prepared or supplied by your school.

#### Grade 2

- o 1. A square sheet of cardboard divided into quarters with one-quarter colored black (about 25 cm x 25 cm).
- 2. 3 flashcards (prepare these)
  - o (a) with number 798
  - (b) with number 401
  - (c) with number 267

(Large enough for whole class to see)



# ONE



COORDINATOR  
AL ANDERSON  
5804 - 109th AVENUE  
EDMONTON, ALBERTA  
T6A 1S2

## Grade 2 (Continued)

- \* 3. A class set of cm rulers--many will have these now. The one listed here shows the dm-cm relationship which is needed for Grade 3. Order from Spectrum.
- \* 4. 1 ice cream bucket (plastic--approximately 2 litres). These come with the pan balance kit.
- \* 5. One 4 - 5 litre bucket with a tape marking at the 3 and 4 litre levels. G plastic pail--2 gallon from Spectrum.
- \* 6. A 1 litre bucket--this is provided in the Grade 1 Tri-Pour Set.
- o 7. 2 boxes filled with material (sand, dirt, cement, etc.). One 2 kg and the other 3 kg.
- \* 8. Balance scale--the one for Grade 1.
- \* 9. 4 kg masses. L Hex Mass from Spectrum.

## Grade 3

- o 1. Flannelboard or magnetic board as for Grade 1.
- \* 2. Rulers as for Grade 1.
- \* 3. A chunk of plasticine for each student. Order from Spectrum.

## Grade 4

- \* 1. cm rulers as for Grades 1, 2, and 3.

## CORRECTING THE TESTS

The Answer Keys are provided for correcting the tests you Administer. Please note the corrections outlined earlier. Transfer the scores for each item to the corresponding number on the Answer Sheet for each Student.

The grade three test Part I poses a special problem. Part I has 49 questions while the Answer Sheets allow only 37 answer spaces. Please note how to transfer the marks for question 38 to 49 on the Part II side of the Answer Sheet on the next page.





**COORDINATOR**  
**AL ANDERSON**  
**5804 - 109th AVENUE**  
**EDMONTON, ALBERTA**  
**T6A 1S2**

ZONE ONE ELEMENTARY MATHEMATICS ANSWER SHEETS

The same answer sheet (red lettering) as enclosed will be used for each grade level. For this reason there are more answer spaces than questions. Grade three caused us some problem. We were unable to include more than 37 answer spaces on one side. Part 1 of grade three has 49 questions. This leaves us 12 spaces short. To accomodate this the optical scorer has been directed to use the last line of side two of the answer sheet. Specific directions are included below. Sorry for this inconvenience.

**SIDE 2**

## PART II

( GRADE FOUR USE THIS SIDE FOR PART III AND IV )

STUDENT PROFILES WILL BE MADE FROM THESE ANSWER SHEETS—PLEASE CHECK THEM

## EXAMPLES

SCORE OF 5 OUT OF 9			SCORE OF 17 OUT OF 20		
A	0	0	B	0	0
	1	1		●	1
	2	2		2	2
		3			3
		4			4
		●			5
		6			6
		7			●
		8			8
		9			9

Note how the one and two digit answers are transferred.

The grade four comment refers to the fact that the Grade 4 test is the only one to have four separate parts.

Question 38 in Part I (Circle the two number sentences that tell the same story) uses Answer Sheet space 25 and so on to where question 49 utilizes the Answer Sheet space marked 36. You do not need to renumber the Answer Sheet.

Bottom Section  
of Part II

38	39	40	41	42	43	44	45	46	47	48	49	37	0	0
25	0	0	26	0	0	27	0	0	28	0	0	29	0	0
	1	1		1	1		1	1		1	1		1	1
	2	2		2	2		2	2		2	2		2	2
	3			3			3			3			3	
	4			4			4			4			4	
	5			5			5			5			5	
	6			6			6			6			6	
	7			7			7			7			7	
	8			8			8			8			8	
	9			9			9			9			9	







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SCHOOL SYSTEM NUMBER	SCHOOL NUMBER	GRADE	SEX
<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9	<input checked="" type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 <input type="radio"/> 9	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input checked="" type="radio"/> 5 <input type="radio"/> 6	<input checked="" type="radio"/> MALE <input type="radio"/> FEMALE
			EARLY OR LATE STARTERS  <input checked="" type="radio"/> EARLY <input type="radio"/> LATE

Record all the digits which are used to identify both school system and school.  
e.g. 02 East Smokey S.D.  
#54 012 Fox Creek.

STUDENT NAME (Last, First)																										
J	a	c	k	s	o	n			C																	

○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
A	●	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
C	C	●	C	C	C	C	C	C	●	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
●	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J
K	K	K	●	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
N	N	N	N	N	N	●	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
O	O	O	O	O	●	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q	Q
R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
S	S	S	S	●	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
X	X	X	X																								

Jackson Cathy  
Grade 5  
Female  
Early Starter  
(From next page)

By recording the student's name on the answer sheet as shown, Cathy's name will appear on the print-out. The last name must begin with the first letter on the far left column. Last name and initial of first name is sufficient. (Fill in letters)



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### EARLY AND LATE STARTERS

Record an E or an L for each student according to the following categories.

Grade	If the student's birthday is <i>before</i>	If the student's birthday is <i>after</i>
Grade 1	Sept. 5, 1972 record Early	Sept. 5, 1972 record Late
Grade 2	Sept. 5, 1971 record an E	Sept. 5, 1971 record an L
Grade 3	Sept. 5, 1970 record an E	Sept. 5, 1970 record an L
Grade 4	Sept. 5, 1969 record an E	Sept. 5, 1969 record an L
Grade 5	Sept. 5, 1968 record an E	Sept. 5, 1968 record an L
Grade 6	Sept. 5, 1967 record an E	Sept. 5, 1967 record an L

### SCHOOL DIVISIONS AND SCHOOLS

- |                                |                              |
|--------------------------------|------------------------------|
| 01 County of Grande Prairie #1 | 05 Grande Prairie S.D. #2357 |
| 02 East Smoky S.D. #54         | 06 High Prairie S.D. #48     |
| 03 Fairview S.D. #50           | 07 Northland S.D. #61        |
| 04 Fort Vermilion S.D. #52     | 08 Peace River S.D. #10      |



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- |  |                                |
|--|--------------------------------|
| 09 Spirit River S.D. #47               | 15 Grovedale S.D. #4910        |
| 10 Roman Catholic Separate Schools     | 16 Calgary S.D. #19            |
| Grande Prairie RCSSD #28               | 17 County of Lamont            |
| Beaverlodge RCSSD #68                  | 18 Red Deer RCSSD              |
| Sexsmith RCSSD #51                     | 19 County of Thorhild          |
| 11 St. Thomas More RCSSD #35           | 20 Jasper School Division      |
| 12 North Peace Separate Schools        | 21 Three Hills School Division |
| 13 South East Peace Catholic Authority | 22 Taber School Division       |
| 14 Independent Schools                 |                                |

\* \* \* \* \*

- |                                       |                               |
|---------------------------------------|-------------------------------|
| 01 <u>County of Grande Prairie #1</u> | 02 <u>East Smoky S.D. #54</u> |
| 001 Beaverlodge Elementary            | 012 Fox Creek                 |
| 002 Bezanson                          | 013 Harry Gray Elementary     |
| 003 Elmworth                          | 014 Harry Gray Primary        |
| 004 Grandview Colony                  | 015 Ridgevalley               |
| 005 Harry Balfour                     | 016 Ridgevalley Colony        |
| 006 Hythe Elementary                  | 017 Sunset House              |
| 007 La Glace                          | 03 <u>Fairview S.D. #50</u>   |
| 008 Sexsmith Public                   | 018 Bear Canyon Central       |
| 009 Teepee Creek                      | 019 Fairview Elementary       |
| 010 Valhalla                          | 020 Hines Creek               |
| 011 Wembley                           | 021 Menno Simons              |
|                                       | 022 Whitelaw                  |
|                                       | 023 Worsley Central           |



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04 Fort Vermilion S.D. #52

- 024 Assumption
- 025 Buffalo Head Prairie
- 026 Fort Vermilion Public
- 027 High Level Public
- 028 La Crete Public
- 029 North Tallcree
- 030 Rainbow Lake
- 031 Rocky Lane
- 032 Sandhills Elementary
- 033 South Tallcree
- 034 Upper Hay River
- 035 Zama City

05 Grande Prairie S.D. #2357

- 036 Avondale Elementary
- 037 Hillside Elementary
- 038 Parkside Elementary
- 039 Swanavon Elementary

06 High Prairie S.D. #48

- 040 C.J. Schurter Elementary
- 041 Carole Bannister
- 042 Driftpile
- 043 E.G. Wahlstrom
- 044 Georges P. Vanier

06 High Prairie S.D. #48 (Continued)

- 045 Girouxville
- 046 High Prairie Elementary
- 047 Jean Cote
- 048 Joussard
- 049 Kinuso
- 050 Langlois
- 051 McLennan Public
- 052 Prairie River Elementary

07 Northland S.D. #61

- 053 Atikameg-Sovereign
- 054 Bishop Routhier
- 055 Cadotte Lake
- 056 Calling Lake
- 057 Chipewyan Lakes
- 058 Conklin
- 059 Dr. Mary Jackson
- 060 Elizabeth Colony
- 061 Fort Chipewyan Public
- 062 Fort MacKay
- 063 Garden Creek
- 064 Gift Lake
- 065 Grouard
- 066 J.F. Dion



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07 Northland S.D. #61 (Continued)

067 Janvier  
068 Jean Baptiste Sewepegaham  
069 Jean D'or Prairie  
070 Kateri  
071 Little Buffalo  
072 Loon Lake  
073 Mistassiniy  
074 Nose Creek  
075 Paddle Prairie  
076 Peerless Lake  
077 Pelican Mountain  
078 St. Theresa

08 Peace River S.D. #10

079 Brownvale  
080 Deadwood  
081 Dixonville  
082 Kennedy Elementary  
083 Lloyd Garrison  
084 Manning Elementary  
085 McGrath Elementary  
086 Nampa Public  
087 Springfield Elementary

09 Spirit River S.D. #47

088 Blueberry Creek  
089 Bonanza  
090 Eaglesham  
091 Rycroft  
092 Savanna  
093 Spirit River Elementary  
094 Wanham  
095 Woking

10 Roman Catholic Separate Schools

Grande Prairie RCSSD #28

096 Holy Cross  
097 St. Clement Elementary  
098 St. Gerard Elementary

Beaverlodge RCSSD #68

099 St. Mary's

Sexsmith RCSSD #51

100 St. Mary's

11 St. Thomas More RCSSD #35

101 St. Thomas More

12 North Peace Separate Schools

102 Fort Vermilion RCSSD #26 -  
St. Mary's Separate

103 Grimshaw RCSSD #88 - Holy Family



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- |   |                                       |
|---|---------------------------------------|
| North Peace Separate Schools (Continued) 17         | <u>County of Lamont (Continued)</u>   |
| 104 Nampa RCSSD #96 - Nampa Separate                | 119 Lamont School                     |
| 105 Peace River RCSSD #43 - Glenmary                | 120 Mundare School                    |
| 106 Peace River RCSSD #43 - Immaculate Conception   | 121 Andrew School                     |
| 107 Rosary RCSSD #37 - Rosary                       | 18 <u>Red Deer RCSSD</u>              |
| 13 <u>South East Peace Catholic Authority</u>       | 122 St. Thomas Aquinas                |
| 108 Falher Consolidated School Dist. #69 - Routhier | 123 Mont Fort Elementary              |
| 109 High Prairie RCSSD #56 - St. Andrew's           | 126 Maryview Elementary               |
| 110 McLennan RCSSD #30 - Providence                 | 127 St. Elizabeth Seton               |
| 111 Spirit River RCSSD #36 - St. Marie              | 128 St. Martin de Porres              |
| 112 Valleyview RCSSD #84 - St. Stephen's            | 19 <u>County of Thorhild</u>          |
| 14 <u>Independent Schools</u>                       | 124 Thorhild Elementary               |
| 113 Peace River Junior Academy                      | 129 Radway School                     |
| 114 Maranatha Junior Academy                        | 130 Newbrook School                   |
| 15 <u>Grovedale S.D. #4910</u>                      | 20 <u>Jasper School Division</u>      |
| 115 Grovedale Penson Elementary                     | 125 Jasper Elementary                 |
| 16 <u>Calgary S.D. #19</u>                          | 21 <u>Three Hills School Division</u> |
| 116 Sam Livingston Elementary                       | 131 Acme School                       |
| 117 Albert Park Elementary                          | 132 Carbon School                     |
| 17 <u>County of Lamont</u>                          | 133 Huxley School                     |
| 118 Chipman School                                  | 134 Lindon School                     |
|   | 135 Three Hills                       |
|   | 136 Turrington                        |



E ONE

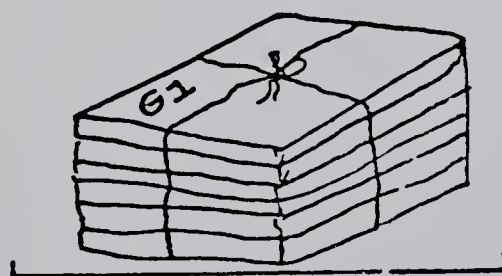


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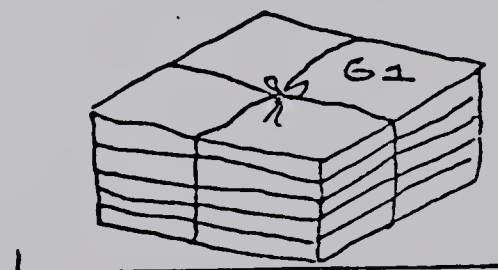
- |  |   |
|--|---|
| <p>21 <u>Three Hills School Division (Continued)</u></p> <p>137 Trochu</p> <p>138 Wimborne</p> <p>139 Valleyview Colony</p> <p>140 Huxley Colony</p> <p>22 <u>Taber School Division</u></p> <p>141 Barnwell School</p> <p>142 Chamberlain School</p> | <p>22 <u>Taber School Division (Continued)</u></p> <p>143 Enchant School</p> <p>144 Hays School</p> <p>145 Central School</p> <p>146 Dr. Hamman School</p> <p>147 L.T. Westlake School</p> <p>148 Vauxhall School</p> |
|--|---|

WHERE THE TEST MATERIALS GO

You may keep all  
student tests for  
the present time.



Teacher Manuals  
Marking Keys  
Unused student  
tests in separate  
envelopes by  
grade level  
are to be sent to  
your central office.



Please send your School's  
Answer sheets separated by  
Grade directly to:  
A. L. Anderson  
Grande Prairie Regional Office  
500 Nordic Court  
10014 - 99 St.  
Grande Prairie, Alberta  
T8V 3N4

Thank you again for the work you have undertaken to make this project possible. If you have any special problems call the Grande Prairie Regional Office at 539-2130 or Edmonton (432-2950).

A.L. Anderson



## A P P E N D I X     I

PARTICIPATING SCHOOL SYSTEMS WITH  
SCHOOL AND PUPIL COUNTS IN 1978



SCHOOL DIVISIONS	NUMBER OF SCHOOLS						
	I	II	III	IV	V	VI	
County of Grande Prairie #1	11	274	301	267	261	259	261
East Smoky S.D. #54	6	217	172	179	197	184	195
Fairview S.C. #50	6	168	146	146	143	144	114
Fort Vermilion S.D. #52	12	454	398	375	303	279	263
Grande Prairie S.D. #2357	4	303	275	240	233	262	264
High Prairie S.D. #48	13	367	323	318	291	313	327
Northland S.D. #61	26	300	423	300	347	356	300
Peace River S.D. #10	9	230	240	214	226	251	240
Spirit River S.D. #47	8	143	163	153	145	155	161
Roman Catholic Separate Schools:	5	139	126	133	135	118	118
Grande Prairie RCSSD #28							
Beaverlodge RCSSD #68							
Sexsmith RCSSD #51							
St. Thomas More RCSSD #35	1	30	32	26	21	32	43
North Peace Separate Schools	6	129	123	134	133	136	130
South East Peace Catholic Authority	5	173	154	167	142	144	134
Independent and Other Schools:							
Grovedale S.D. #4910	1	12	15	23	14	16	15
Maranatha Junior Academy	1	3	3	4	3	5	4
Peace River Junior Academy	1	10	7	6	8	5	6
Out of Zone Schools:							
Calgary S.D.	2	68	88	78	73	88	100
County of Lamont	4	112	115	141	108	145	153
County of Thorhild	1	38	47	36	37	48	48
Jasper S.D.	1	23	23	54	45	45	61
Red Deer S.D.	2	28	47	28	33	33	68
Actual totals	125	2293	2485	2117	2309	2364	2211

PARTICIPATING SCHOOL SYSTEMS WITH SCHOOL AND PUPIL COUNTS IN 1978



A P P E N D I X    J

A SUPPLEMENTARY PRINT-OUT FOR THE  
CENTRAL OFFICES - GRADE FOUR



NE ONE



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## PERCENTAGE MEANS FOR ZONE

ZONE ONE

GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & MEASUREMENT PROPERTIES		GEOMETRY		GRAPHING	
1	58.7%	1	61.2%	1	63.4%	1	83.9%
2	53.8%	2	43.3%	2	52.8%	2	79.1%
3	50.3%	3	43.1%	3	31.6%	3	64.9%
4	79.8%	4	54.4%	4	52.6%	4	49.8%
5	45.6%	5	54.0%	5	58.8%		
6	60.2%	6	70.5%	6	60.7%		
7	57.9%	7	41.3%	7	64.1%		
8	16.2%	8	49.7%	8	45.7%		
9	49.8%	9	64.0%	9	21.8%		
		10	81.0%				
AVG		52.5%	56.2%	50.2%	63.5%	69.5%	

## PERCENTAGE MEANS FOR ZONE

OUT OF ZONE

GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & MEASUREMENT PROPERTIES		GEOMETRY		GRAPHING	
1	61.8%	1	67.7%	1	64.7%	1	87.9%
2	57.0%	2	47.5%	2	57.3%	2	80.9%
3	55.7%	3	43.0%	3	30.3%	3	66.9%
4	83.1%	4	62.3%	4	59.9%	4	51.7%
5	48.8%	5	65.2%	5	66.9%		
6	65.1%	6	80.1%	6	70.9%		
7	65.1%	7	50.0%	7	65.3%		
8	15.4%	8	60.0%	8	53.6%		
9	51.0%	9	70.2%	9	13.4%		
		10	85.2%				
AVG		55.9%	63.1%	53.6%	65.3%	71.8%	



## COMPARING MASTERY LEVELS OF MALES AND FEMALES

ZONE ONE

GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1M	57.6%	1M	57.9%	1M	62.8%	1M	73.8%	1M	83.6%
F	59.9%	F	65.0%	F	64.0%	F	77.8%	F	84.4%
2M	51.7%	2M	40.8%	2M	54.7%	2M	56.0%	2M	77.3%
F	56.2%	F	46.0%	F	50.7%	F	56.4%	F	81.3%
3M	51.5%	3M	41.8%	3M	32.8%	3M	57.7%	3M	63.5%
F	49.0%	F	44.5%	F	30.3%	F	59.9%	F	66.6%
4M	77.8%	4M	51.4%	4M	52.4%			4M	49.5%
F	82.0%	F	57.7%	F	52.7%			F	50.2%
5M	43.5%	5M	52.7%	5M	59.1%				
F	47.9%	F	55.6%	F	58.3%				
6M	59.2%	6M	67.1%	6M	59.9%				
F	61.3%	F	74.2%	F	61.6%				
7M	54.0%	7M	39.9%	7M	64.9%				
F	62.3%	F	42.9%	F	63.2%				
8M	14.8%	8M	48.3%	8M	45.2%				
F	17.9%	F	51.3%	F	46.3%				
9M	48.0%	9M	58.8%	9M	21.5%				
F	51.8%	F	69.9%	F	22.2%				
		10M	78.9%						
		F	83.3%						
<hr/>									
AVM	50.9%	M	53.8%	M	50.4%	M	62.5%	M	68.4%
L	54.3%	F	59.0%	F	49.9%	F	64.7%	F	70.6%

## COMPARING MASTERY LEVELS OF MALES AND FEMALES

OUT OF ZONE

GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1M	61.2%	1M	66.2%	1M	68.3%	1M	73.2%	1M	87.6%
F	62.6%	F	69.5%	F	60.4%	F	80.5%	F	88.2%
2M	52.9%	2M	45.6%	2M	59.3%	2M	51.6%	2M	78.5%
F	61.8%	F	49.7%	F	55.0%	F	58.2%	F	83.8%
3M	59.0%	3M	39.5%	3M	32.8%	3M	62.3%	3M	66.8%
F	51.8%	F	47.0%	F	27.3%	F	67.9%	F	66.9%
4M	80.4%	4M	60.1%	4M	63.1%			4M	52.1%
F	86.2%	F	65.0%	F	56.2%			F	51.3%
5M	47.9%	5M	64.1%	5M	66.9%				
F	49.8%	F	66.5%	F	66.8%				
6M	63.0%	6M	77.8%	6M	69.8%				
F	67.6%	F	82.8%	F	72.3%				
7M	61.0%	7M	49.1%	7M	68.4%				
F	69.9%	F	51.1%	F	61.7%				
8M	16.7%	8M	59.1%	8M	53.6%				
F	13.9%	F	61.1%	F	53.5%				
9M	53.2%	9M	66.1%	9M	13.0%				
F	48.5%	F	75.0%	F	13.9%				
		10M	84.7%						
		F	85.7%						
<hr/>									
AVM	55.0%	M	61.2%	M	55.0%	M	62.3%	M	71.2%
L	56.9%	F	65.3%	F	51.9%	F	68.9%	F	72.6%



## ZONE ONE

## GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1E	57.1%	1E	59.7%	1E	62.5%	1E	73.7%	1E	82.1%
L	63.5%	L	64.5%	L	66.2%	L	79.0%	L	87.5%
2E	51.2%	2E	40.5%	2E	51.7%	2E	53.1%	2E	76.9%
L	58.7%	L	49.3%	L	55.8%	L	60.7%	L	82.9%
3E	48.4%	3E	41.1%	3E	29.7%	3E	57.0%	3E	62.0%
L	54.8%	L	47.3%	L	35.1%	L	61.9%	L	70.6%
4E	78.9%	4E	53.1%	4E	51.6%			4E	46.9%
L	81.9%	L	57.0%	L	54.7%			L	54.2%
5E	42.2%	5E	51.7%	5E	56.8%				
L	51.4%	L	58.7%	L	62.3%				
6E	57.9%	6E	68.6%	6E	58.3%				
L	65.6%	L	74.1%	L	65.1%				
7E	56.6%	7E	39.6%	7E	62.1%				
L	61.0%	L	44.8%	L	67.7%				
8E	13.4%	8E	47.5%	8E	44.2%				
L	22.3%	L	53.8%	L	48.8%				
9E	46.1%	9E	61.2%	9E	19.7%				
L	57.2%	L	69.6%	L	24.3%				
		10E	80.2%						
		L	83.0%						
<hr/>									
AVE	50.2%	E	54.3%	E	48.5%	E	61.3%	E	67.0%
L	57.4%	L	60.2%	L	53.3%	L	67.2%	L	73.8%

## COMPARING MASTERY LEVELS OF EARLY AND LATE STARTERS

## OUT OF ZONE

## GRADE FOUR

JUNE/79

NUMBER		OPERATIONS & PROPERTIES		MEASUREMENT		GEOMETRY		GRAPHING	
1E	60.5%	1E	67.3%	1E	62.3%	1E	73.8%	1E	86.8%
L	63.5%	L	68.0%	L	68.2%	L	80.4%	L	89.5%
2E	56.9%	2E	48.3%	2E	56.2%	2E	54.6%	2E	80.3%
L	57.5%	L	46.7%	L	59.0%	L	54.2%	L	81.8%
3E	51.8%	3E	42.2%	3E	29.5%	3E	64.1%	3E	65.5%
L	61.5%	L	44.3%	L	31.7%	L	66.0%	L	68.5%
4E	83.0%	4E	61.4%	4E	60.1%			4E	52.6%
L	83.0%	L	63.8%	L	59.8%			L	50.5%
5E	45.9%	5E	64.1%	5E	66.3%				
L	53.5%	L	66.6%	L	68.1%				
6E	64.1%	6E	79.5%	6E	70.6%				
L	66.2%	L	80.9%	L	71.8%				
7E	64.1%	7E	50.6%	7E	64.1%				
L	66.4%	L	49.3%	L	67.4%				
8E	14.3%	8E	57.0%	8E	54.0%				
L	17.2%	L	64.4%	L	53.0%				
9E	51.1%	9E	70.1%	9E	12.9%				
L	51.3%	L	70.0%	L	14.3%				
		10E	83.8%						
		L	87.2%						
<hr/>									
AVE	54.6%	E	62.4%	E	52.9%	E	64.2%	E	71.3%
L	57.8%	L	64.1%	L	54.8%	L	66.9%	L	72.6%





**B30258**